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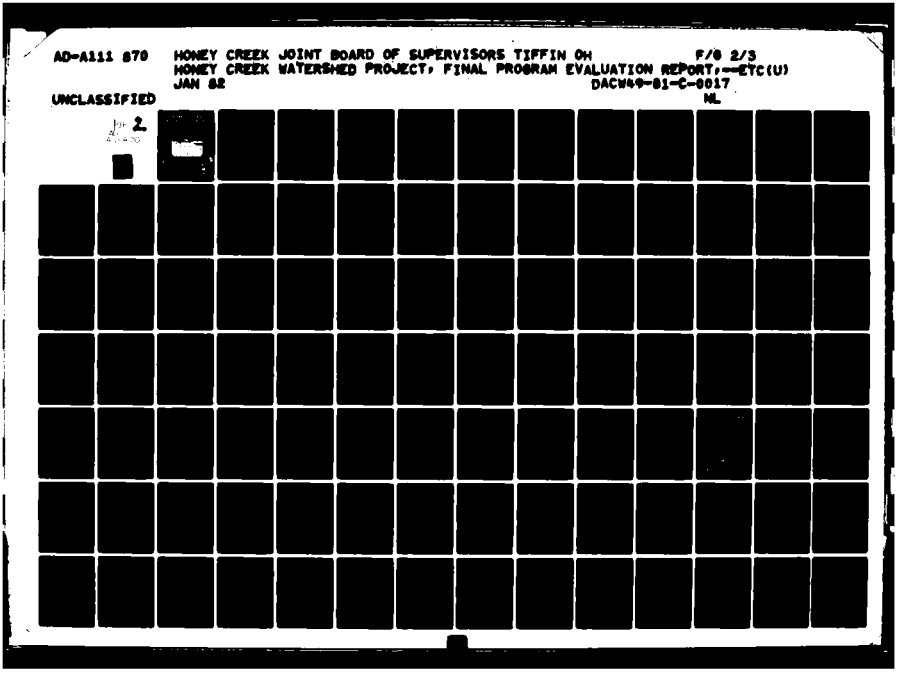

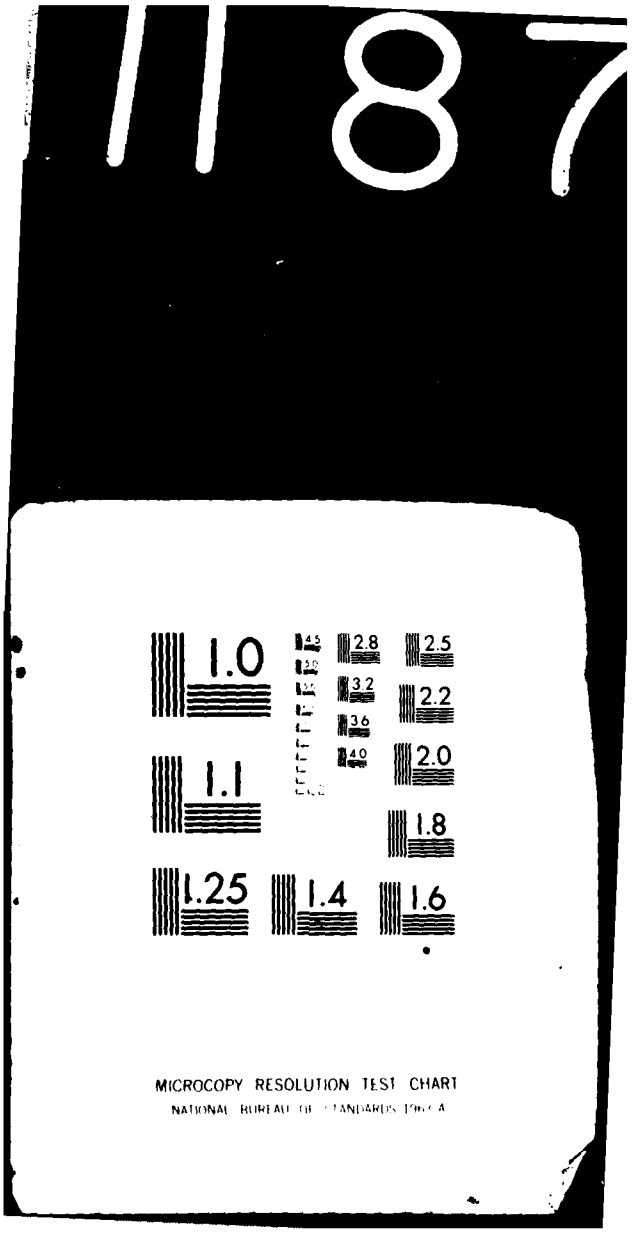
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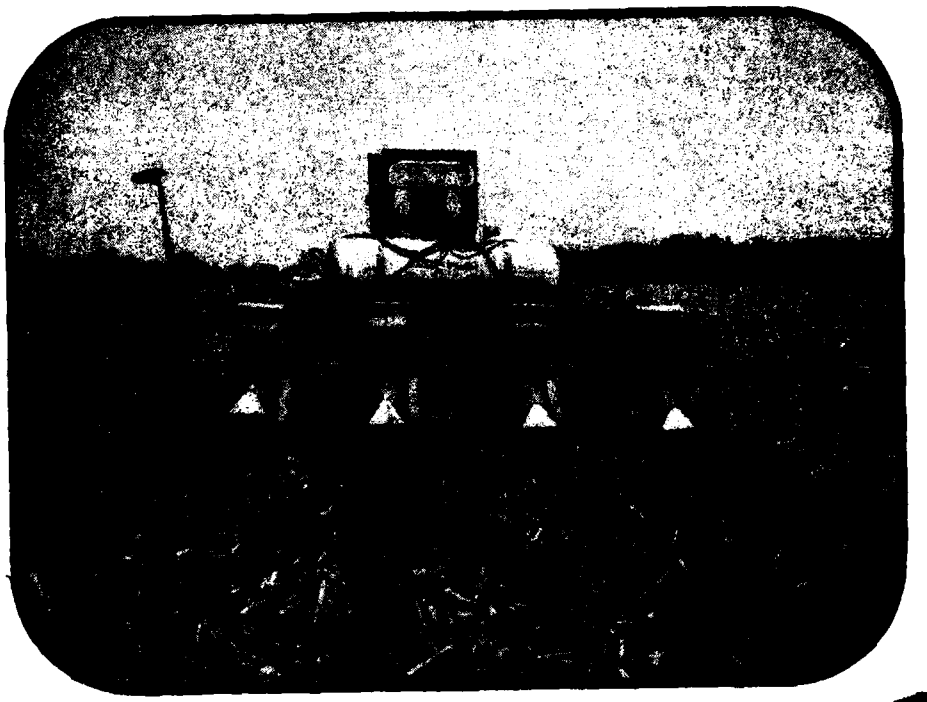
HONEY CREEK WATERSHED PROJECT

FINAL PROGRAM EVALUATION REPORT 1979-1981



PREPARED FOR THE
LAKE ERIE WASTEWATER
MANAGEMENT STUDY
U.S. ARMY ENGINEER DISTRICT, BUFFALO

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report summarizes results of a pilot program for the implementation of agricultural best management practices (BMP's) to control nonpoint sources of pollution. The program was performed within the Honey Creek Watershed, North Central Ohio. The evaluation includes considerations of: (1) project accomplishment by contract tasks and (2) method of accomplishment.

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HONEY CREEK WATERSHED PROJECT

FINAL PROGRAM EVALUATION REPORT
1979 - 1981

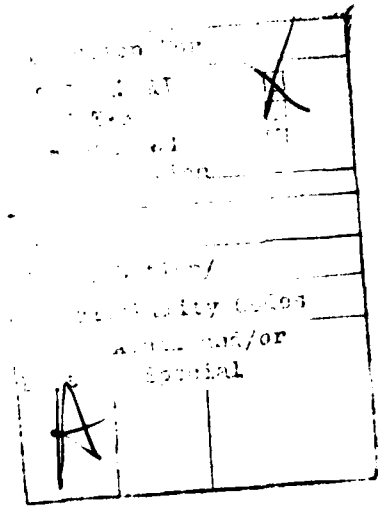
Project Report for
Contract DACW-49-81-C-0017

by

HONEY CREEK JOINT BOARD OF SUPERVISORS
Crawford, Seneca and Huron Counties, Ohio

January 1982

Lake Erie Wastewater Management Study
U. S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207



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PREFACE

In November, 1978, following recommendations from the Lake Erie Wastewater Management Study, the U. S. Army Corps of Engineers, Buffalo District, contracted with the Honey Creek Joint Board of Supervisors (Crawford, Huron and Seneca Soil and Water Conservation Districts, Ohio) to carry out a three year pilot program to demonstrate an administrative approach for the implementation of agricultural best management practices (BMP's) to control nonpoint sources of pollution. This report summarizes results of the pilot program performed within the Honey Creek watershed, North Central Ohio. The evaluation serves as written documentation that the Corps of Engineers may use in preparing recommendations to the U. S. Congress on an overall strategy to "restore and rehabilitate" Lake Erie. The evaluation specifically provides information on ways to carry out programs and implement practices designed to reduce erosion and the loss of sediment bound nutrients, specifically phosphorus, to streams. A second purpose of the report is to provide insight gained from Honey Creek experience that would be useful to others planning similar efforts. Thus, this evaluation includes considerations of: (1) project accomplishment by contract tasks and (2) method of accomplishment.

"There is as yet no ethic dealing with man's relation to land and to the animals and plants which grow upon it . . . . The land-relation is still strictly economic, entailing privileges but not obligations . . . . Obligations have no meaning without conscience, and the problem we face is the extension of the social conscience from people to land.

No important change in ethics was ever accomplished without an internal change in our intellectual emphasis, loyalties, affections, and convictions. The proof that conservation has not yet touched these foundations of conduct lies in the fact that philosophy and religion have not yet heard of it. In our attempt to make conservation easy, we have made it trivial."

From: "A Sand County Almanac"
Aldo Leopold

I. SUMMARY AND CONCLUSIONS

The Honey Creek approach, emphasizing one-on-one technical assistance to farmers, supported by information-education and incentive payment programs, has been successful in accelerating acceptance and application of best management practices (BMP's), particularly conservation tillage, in the Honey Creek watershed. Key factors contributing to success were:

- Farmer and agency involvement in the prior planning of demonstration programs similar to the Honey Creek effort. These commitments helped insure initial acceptance of Project purpose.
- Additional funds for accomplishment of work goals. Funds helped establish work priorities and enabled extra staffing.
- Local farmer leadership, Honey Creek Joint Board, ASCS County Committees.
- Cooperative agency support and guidance in terms of both dollars and time. Key support came from SCS, ASCS, and CES.
- County task forces. Organized to help guide and perform Project work, task forces gave the Project credibility and made it work. Farmer membership on the task forces was of paramount importance.
- Agribusiness involvement. Custom applicators and equipment dealers, because of their knowledge about the Project, made special efforts to help demonstrate BMP's and to hold educational workshops.
- An information-education program targeted to farmers yet comprehensive enough to include others directly (agribusiness) or indirectly (vo-ag students, general public) involved in the Project.
- A sound technical basis for Project work. Inputs from SCS, CES, state experiment stations and other sources of scientific expertise were solicited.
- Demonstration of successful BMP's. Seeing results on the ground

inspired Board members, agency representatives and farmers. All involved could share credit for success.

- Willingness of farmers to try conservation tillage on portions of their farm in need of treatment.
- Farmer interest in long-term implications of Project results.
- Demonstrating BMP's with interested and reputable landowners first. Successes here paved the way for greater subsequent BMP implementation.
- Availability of special ACP cost share funds. These additional monies complemented Joint Board incentive payments limited to demonstration BMP's only and as a result greatly accelerated practice application, especially no-till and grassed waterways.
- Positive and enthusiastic attitude of Project staff. A positive approach insured efficient execution of tasks and instilled confidence in others.
- Close liaison between the Corps of Engineers and the Joint Board. Such working relationships bridged the gap between expectation and reality and made the interests of both work toward achieving a common goal.
- Program inclusion of grassed waterways, erosion control structures and animal waste treatment systems as BMP's. It was often through these more familiar practices that farmers decided to try conservation tillage.

As part of the Honey Creek Project, an inventory of the 11,000 acre Upper Honey Creek (UHC) watershed was conducted to collect field reliable Universal Soil Loss Equation data for validation of similar data within the Land Resources Information System (LRIS), a computerized data system developed by th Corps of ngineers for use in the Lake Erie Wastewater Management

Study, Validation of LRIS files, containing data gathered or estimated from existing records or maps, was necessary to insure that predictions or calculations made using LRIS were reliable. Key conclusions were:

- Manual calculations comparing most of the UHC field inventory data with LRIS data showed that for the watershed as a whole, erosion predictions using either data base were similar. However, for specific soil types, UHC data tended to over-estimate soil losses on flatter soils and under-estimate soil losses on steeper soils.
- Because of typically greater UHC cropping-management ("C") factors, application of conservation tillage practices will have a greater impact on soil loss than would be expected using LRIS data base "C" factors. Thus, programs designed to accelerate implementation of conservation tillage may potentially have a far greater impact on reducing erosion (improving water quality) than originally thought.

Farmer interest in conservation tillage was strong and increased substantially each year of the Project.

- Within the Project area, total acres of conservation tillage for 1979, 1980 and 1981 were 1183, 2669 and 8350, respectively. This amounted to a second year increase of more than 2 times and a third year increase of about 3 times. In 1981 conservation tillage was applied to about 9% of all cropland in the watershed.
- Spin-off benefits, those acres done outside the Honey Creek watershed but within the three counties sponsoring the Project, were great. These added acres of conservation tillage for 1979, 1980 and 1981 were 1184, 3422 and 7820, respectively, acre accomplishments almost identical to those within the watershed.
- About two-thirds of all conservation tillage was no-till, the remainder some form of reduced tillage.

While initial farmer incentive payment rates for conservation tillage were high (as great as $125 per acre for a 10-15 acre no-till demonstration), average rates decreased substantially as acres of spin-off accomplishment spread. As a result, in the first year alone, 1979, incentive payment rates for conservation tillage practices, no-till and reduced tillage, averaged only $21 per acre. In 1980 and 1981, rates dropped even further, $10 and $6 per acre, respectively.

Total conservation tillage program costs, technical assistance plus incentive payment and information-education programs, for the 3 year Honey Creek Project were $392,000. In terms of estimated erosion and phosphorus reductions, conservation tillage program costs averaged $4 per ton of soil and $89 per kilogram of phosphorus. Assuming that similar levels (acres) of conservation tillage adoption continue for 20 years as a result of Project effort, unit costs would be reduced further, $.32 per ton of soil and $6.77 per kilogram phosphorus.

Tillage demonstrations tended to confirm research data. No-till and reduced tillage practices can be used profitably on North Central Ohio soils if proper management is employed. In terms of crop yield and net return per acre, 3 year averages showed:

	Corn		Soybeans	
	Yield bu/ac	Net return $/ac	Yield bu/ac	Net return $/ac
Conventional	127.4	57	45.1	151
Reduced tillage	124.0	38	41.8	127
No-till	114.3	24	46.6	170
No-till, excluding Urea-N and cover crop plots	121.4	46		

Production costs for all tillage systems averaged $250 per acre for corn and $150 per acre for soybeans. Material costs (herbicides, fertilizers, etc.) for no-till crops were more than offset by reduced machinery costs (plowing, planting, etc.) when compared to conventional systems. Optimal production cost savings occurred in reduced tillage systems where

both material and machinery costs tended to be lower.

An important program alteration was a decision early in the Project to hire a full-time person to assist with implementation of conservation tillage BMP's. After only several months of operation, task force and Joint Board members realized that the Project had created sufficient quantities of new work that could not be done with existing manpower, project manager and agency representatives. While there was concern that creation of a Project staff could detract from the concept of work performance by existing agencies, the Joint Board-Corps of Engineers contract was modified and a project conservationist hired.

Significant impressions and observations experienced by the Joint Board during the Project were:

- Programs for implementing BMP's can probably be run most effectively if administered within a single county. Multi-county arrangements were possible but led to inefficiencies and caused problems with supervision of technical staff serving both counties. Single county programs can readily utilize existing organizational arrangements to include lines of communication and lines of authority.
- Minimal amounts of paperwork and reporting required by the Corps of Engineers permitted freedom in Joint Board administration of the Project and enabled staff to spend a majority of their time on actual task work.
- In an area where reduced tillage and no-till practices were uncommon, one-on-one contacts between farmers and a tillage technician were the best way to begin implementation of these practices.
- Prior to receipt of contract funds, "up-front" monies were needed to initiate certain Project work. Counties lacking these funds would be handicapped in hiring personnel or making available no-till

planters, thus reducing chances of a successful start.

- Initiating a county program to accelerate adoption of conservation tillage BMP's using the Honey Creek approach would require a minimum of 20-30 thousand dollars per year if reasonable success is expected.
- While cover crops like rye had several advantages, they also had certain disadvantages which decreased chances of a positive no-till experience, particularly for corn. Green growing cover crops attracted armyworms, necessitating spraying, and in a wet spring, large cover crop growth delayed soil warming and drying. This latter influence, in fields of less than ideal drainage, slowed germination and early plant growth and caused greater opportunity for loss of nitrogen fertilizers.

II. RECOMMENDATIONS

All similar BMP implementation efforts should include local leadership.

A full-time person should be available to work with farmers on conservation tillage BMP implementation. Demonstrations should be an important part of early implementation.

Local BMP implementation programs should be supported by USDA agencies with major responsibilities as follows:

1. SCS - technical support: soils information, engineering and conservation tillage BMP's.
2. CES - technical support: information-education, training of tillage technician, conservation tillage BMP's.
3. ASCS - cost share incentives: 2-3 year duration of no-till practice, engineering practices.

Programs should include farmer involvement, particularly when planning work within the county, watershed or program area.

Programs should include agri-business involvement as well, especially when their business function is required to successfully implement BMP's.

Funds should be made available to encourage program implementation and to enable program continuance once started. Sufficient funds should be appropriated to cover basic costs of:

1. Administration - operation
2. Land rent incentives for conservation tillage demonstrations
3. Salary for full-time conservation tillage technician.
4. Special information-education activities such as signs, brochures, and workshops.

III. PROJECT BACKGROUND

Based on Section 108d of PL 92-500, the U. S. Congress charged the U. S. Army Corps of Engineers with developing "a recommended wastewater management program to restore and rehabilitate Lake Erie." The resulting Lake Erie Wastewater Management Study determined that:

1. Phosphorus was the key nutrient element contributing to Lake Erie eutrophication or over-enrichment.

2. More than 40% of the phosphorus entering the lake came from diffuse or nonpoint sources.

3. Runoff from agricultural land was the most significant nonpoint phosphorus source, particularly from land draining into western Lake Erie.

4. Suspended sediments, especially fine clays, are the most active phosphorus transport agents.

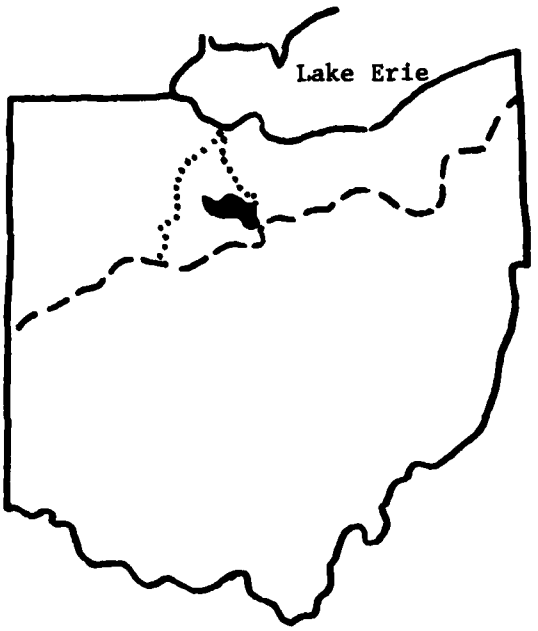
5. Conservation tillage (reduced tillage or no-till) can be effectively used on many Lake Erie basin soils to reduce erosion and phosphorus loss.

6. That economic returns resulting from the application of conservation tillage can be positive.

Because of the importance and need to include controls for nonpoint phosphorus sources in the overall strategy to improve lake water quality, the U. S. Army Corps felt it best to test or demonstrate a program that would accelerate the implementation of practices (best management practices or BMP's), especially conservation tillage, which improve the quality of runoff from farm land. As a result the Lake Erie Wastewater Management Study Methodology Report recommended that: ". . . . a demonstration program be implemented in a specific watershed and the results assessed with regard to applicability to other areas in the drainage basin in terms of reducing pollutant loading to the lake. Since economic

incentives exist to adopt land management practices which improve water quality, an accelerated education and technical assistance program should be undertaken." At the same time the Corps of Engineers was developing strategies to improve the lake, landowner and conservation agency efforts were underway to secure funds for a model demonstration project within the Honey Creek watershed. The three phase 9 million dollar project would last 9 years, attempt full-scale implementation over the 150 square mile agricultural watershed and comprehensively evaluate and assess program effectiveness, both administratively and from the standpoint of BMP's. When it was learned that funding for a project of this magnitude was scarce, local agencies modified the proposal and applied for implementation monies through the Model Implementation Program of USDA/USEPA. While neither proposal was ever selected for funding, local people and agencies were prepared when the Corps of Engineers expressed interest in using the Honey Creek watershed to test their demonstration program.

Thus, in November of 1978, the Honey Creek Joint Board of Soil and Water Conservation District Supervisors (Huron, Crawford, Seneca counties), formed to coordinate and administer previous demonstration proposals, signed a contract with the Buffalo District of the U. S. Army Corps of Engineers to carry out a 3 year program to demonstration an approach to successfully implement BMP's. (See Appendix A, Description of Contract Tasks.) The approach, to be developed by the Joint Board, was to include information-education activities, technical assistance to landowners and the demonstration of BMP's. Work was to be accomplished in two phases: (I) 1979, Upper Honey Creek watershed, Crawford County, 11,000 acres and (II) 1980-1981, entire Honey Creek watershed, Crawford, Huron and Seneca Counties, 120,000 acres (Figure 1).



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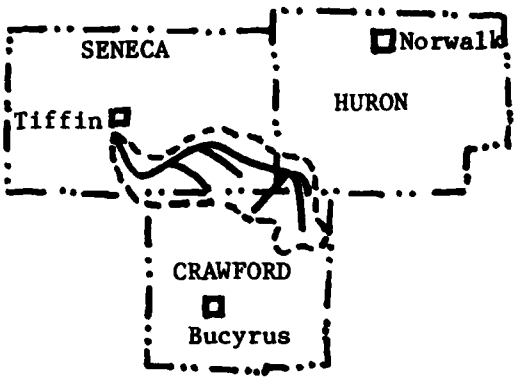
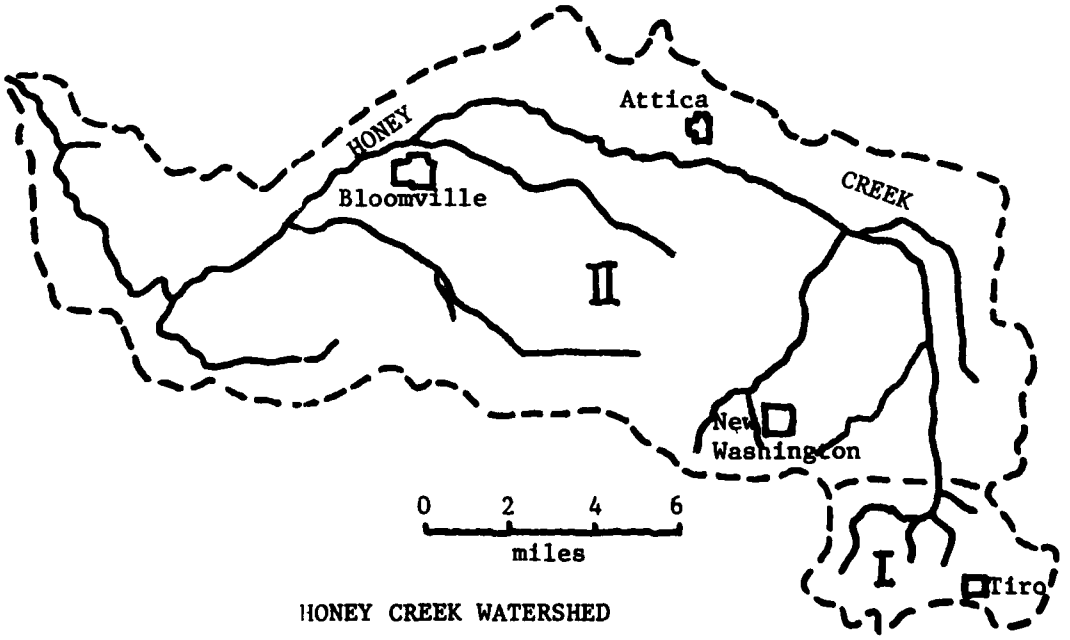


RELATION TO COUNTIES
AND COUNTY SEATS



HONEY CREEK WATERSHED

Figure 1. Honey Creek watershed as located in Seneca, Crawford, and Huron Counties in the State of Ohio.

IV. PURPOSE OF PROGRAM EVALUATION

Purpose of this evaluation is to produce written documentation to assist the U. S. Army Corps of Engineers in developing the nonpoint source component of the overall strategy to rehabilitate Lake Erie waters. A secondary purpose is to provide thoughts or ideas gained from Honey Creek experience that would be useful to others planning similar efforts. Thus, the evaluation includes considerations of (1) project accomplishment by contract tasks and (2) method of accomplishment. (See Appendix B, Project Accomplishment and Method of Accomplishment.)

V. APPROACH TO PROJECT ACCOMPLISHMENT

The approach used to demonstrate implementation of BMP's within the Honey Creek watershed did not materialize magically. Participants in early negotiations between the Corps and Joint Board, assisted by USDA representatives, made certain basic assumptions prior to finalizing a contract designed to yield successful results. These assumptions were:

1. Local government with support from USDA can work to improve the quality of runoff from agricultural land.

2. Those involved in the project should understand the project and, where appropriate, share in its development.

3. The program set forth should be technically sound, both from the standpoint of technical services and more general technical information.

4. Portions of the watershed in critical need of treatment could be identified.

5. One-to-one contacts with farmers would be an important part of successful BMP implementation.

6. Monetary incentives would be an important part of project start-up.

7. Working with reputable, progressive farmers having fields in need of treatment would help insure continued future implementation.

With these assumptions in mind, organizers conceived a basic, administrative/management framework to perform tasks. Included in the framework were the Army Corps, Joint Board, a state-level Interagency Advisory Group and at the working level, county task forces.

Role of the Corps of Engineers was to finalize a contract as negotiated, provide base funding to initiate the Project and provide technical information or resource data where appropriate, to aid Project work. For example, information on phosphorus loading to Lake Erie from both

point and nonpoint sources was useful in helping local persons understand how and why the Project was a part of the Lake Erie Study. Similarly, soil management group data from the Land Resources Information System (LRIS) system enabled early determination of those soils where conservation tillage would work well in reducing erosion and providing positive economic returns to farmers.

The Joint Board, on the other hand, was to provide local leadership and direction to insure contract completion. They were to also administer contract funds, assess Project operations and progress plus provide personnel to conduct the Upper Honey Creek field inventory. A project manager was hired to help perform these jobs and was headquartered at the Seneca County Agriculture Center, Tiffin, Ohio.

An Interagency Advisory Group, including state-level representatives from the Ohio Department of Natural Resources, Division of Soil and Water Districts (ODNR), Ohio Department of Agriculture (ODA), Ohio Environmental Protection Agency (OEPA), U. S. Soil Conservation Service (SCS), U. S. Agricultural Stabilization and Conservation Service (ASCS) and the Ohio Cooperative Extension Service (CES) was formed to provide the Joint Board with direction and guidance from a state and federal perspective. In particular, Interagency members assisted the Joint Board in review of work progress and suggested ways, based on existing agency roles, policies and procedures, to efficiently accomplish contract tasks. These same Interagency representatives in turn gave their respective counterparts at area and local levels guidance as to how and when to assist Joint Board work.

Finally, County Task Forces were formed in each county to advise the project manager on how to best perform on the ground or day to day work. Task force members, including USDA agency representatives (ASCS, SCS, CES), the project manager, 2 or 3 farmers from the watershed and a local Soil and

Water Conservation District (SWCD) representative were also to assist task work.

Task force representatives were selected for the specific contribution each could make:

1. SCS -

   a. Technical assistance in the design and implementation of engineering BMP's, plus assistance in selection of soils suitable for conservation tillage BMP's.

   b. Technical guidance to project manager on proper field inventory procedures relating to Universal Soil Loss Equation and practice needs.

   c. Technical assistance on the determination of priority treatment areas based on soil types and erosion rates.

2. CES -

   a. Technical assistance for the proper implementation of conservation tillage BMP's.

   b. Technical information to support an information-education program.

3. ASCS -

   a. Provide lists of potential cooperators and assist in information mailings to landowners.

   b. Direct county Agricultural Conservation Program (ACP) to complement efforts of Joint Board by encouraging cost share for BMP's.

4. SWCD -

   a. Assist in the survey, design and construction of engineering BMP's.

   b. Keep necessary financial and adminstrative records to insure proper project operation.

c. Encourage agri-business involvement in support of project activities.

5. Farmers -

a. Feedback to insure workability of specific project activities.

b. Input to aid practical application of BMP's, especially conservation tillage methods and procedures.

One task force also had as a member the County Engineer who helped complete roadside stabilization work, and mow sod berms along field ditches.

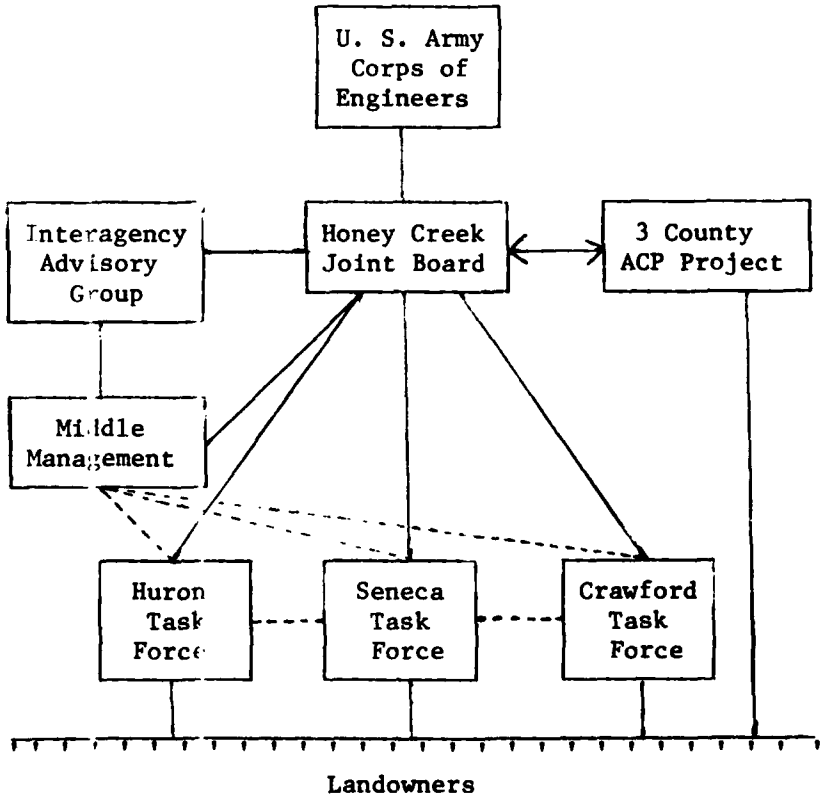
Somewhat outside this basic administrative framework but instrumental to its function, was the USDA-Corps liaison. While his primary job was to interject USDA perspective and technical knowledge into the Lake Erie Wastewater Management Study, he initially worked closely with the Joint Board, project manager and task forces to help organize and direct efforts to complete contract tasks. During the three year Project, he continued to advise the manager or Board where appropriate; viz., key decisions affecting Project operation and planning of area or basin-wide information-education activities.

Participants in early project planning also evolved a budget which they felt would be sufficient to complete task work. Again the budget assumed program support in terms of manpower from existing USDA agencies. Initial 1979 budget was set st $70,000 to cover project coordination and field inventory work by the project manager plus special costs for information-education materials, project signs for demonstration practices and payments to farmers participating in demonstration practices. While subsequent budgets for 1980 and 1981 were to be formulated by the Joint Board and supporting agencies, it was estimated that they would range from $80,000 to $100,000 per year.

Early during 1979 the budget situation was changed significantly

when local county ASCS committees applied for and received an additional $70,000 of special ACP cost share funds to be used for BMP's within the Honey Creek watershed. Similar funding was subsequently approved for both 1980 and 1981. These extra monies resulted in changes of the project administrative framework as well, requiring even closer coordination between the Joint Board and respective ASCS county committees. Figure 2 depicts organizational structure which existed throughout most of the Project.

Figure 2. Honey Creek Watershed Project Organization Framework



VI. CONSERVATION TILLAGE AS A BMP

First, what is conservation tillage? The Soil Conservation Service in Ohio defines conservation tillage as a "method of working the land leaving crop residue on the surface to protect the soil from the erosive forces of wind and rain." For the Honey Creek Project, conservation tillage has been defined as any tillage system that leaves a minimum of 1000 pounds of previous crop residue on the soil surface at planting. The ultimate conservation tillage system is"no-till" where virtually all previous crop residue remains on the surface at planting, normally 4000 to 6000 pounds expressed as corn residue equivalent. Tillage systems incorporating a portion of previous crop residue but having more than 1000 pounds on the surface at planting time are described as "reduced" tillage systems. Table 1 gives a comparison of tillage systems based on the amount of previous crop residue left on the soil surface at planting, showing tillage operations that might typically occur in each.

A. Acre accomplishment.

Strategies being considered by the U. S. Army Corps of Engineers to reduce agricultural nonpoint source phosphorus loading to Lake Erie rely heavily on the ability of farmers to successfully apply conservation tillage practices to significant portions of the Lake Erie basin. Results from the Honey Creek Watershed Project, where a combination of technical assistance plus information-education and cost-share programs were employed to speed implementation of reduced and no-tillage practices indicate that farmers are willing to try practices and that interest both within and outside (surrounding 3 counties, see Figure 2, page 18) the project area seems to expand with time. More specifically, Table 2 shows that:

Table 1. Comparison of Tillage Systems by Amounts of Previous Crop Residue on Soil Surface at Planting and by Mechanical Operations That Might Typically Occur in Each.

	Conservation Tillage	
Conventional Tillage	Reduced Tillage	No-till
Spring fertilize	Spring fertilize	Spring fertilize
Plow	Chisel plow	Plant
Disk - 1	Disk	Spray - 1
Disk - 2	Plant	Spray - 2
Level	Spray	Combine
Plant	Combine	
Spray		
Cultivate - 1		
Cultivate - 2		
Combine		
0 to 1000 pounds residue at planting	1000 pounds plus residue at planting	

Table 2. Payments made to landowners for implementing conservation tillage and acres treated by practice during the Honey Creek Watershed Project.

	Demonstration Project ($/Ac)	Special ACP Project ($/Ac)	Est. other acres in watershed	Regular ACP in 3 counties ($/Ac)	Est. other acres in 3 counties	Summary Effort ($/Ac)
1979						
No-till $	17500 (125)	7117 (28)	None	12000 (28)	None	36617 (23)
Acres	140	253	300	430	450	1573
Reduced Tillage $	10000 (86)	2170 (29)	None	1000 (29)	None	13170 (17)
Acres	116	74	300	34	270	794
Total $	27500	9287	-	13000	-	49787
AC	256	327	600	464	720	2367
1980						
No-till $	17300 (80)	11589 (25)	None	27000 (25)	None	55889 (12)
Acres	216	460	1300	1080	1450	4506
Reduced Tillage $	2200 (80)	1478 (24)	None	1000 (24)	None	4678 (3)
Acres	28	65	600	42	850	1585
Total $	19500	13067	-	28000	-	60567
Ac	244	525	1900	1122	2300	6091
1981						
No-till $	24000 (80)	25000 (25)	None	48000 (25)	None	97000 (8)
Acres	300	1000	5000	1920	3400	11620
Reduced Tillage $	4000 (80)		None		None	4000 (1)
Acres	50		2000		2500	4550
Total $	28000	25000	-	48000	-	101000
Ac	350	1000	7000	1920	5900	16170

1. Of the total acres treated in 1979, 1184 acres or 50% were done outside the project area; in 1980, 3422 acres or 56%; and in 1981, 7820 acres or 48% outside the project area.
2. Of the total acres treated in 1979, an estimated 1320 acres or 56% were done without the benefit of monetary incentives; in 1980, 4200 acres or 69%; and in 1981, 12900 acres or 80% without incentives.
3. Within the project area, total acres treated for 1979, 1980, and 1981 were 1183, 2669, and 8350, respectively. This amounts to a second year increase of more than 2 times and a third year increase of about 3 times.
4. For the summary effort (project area plus surrounding 3 counties), total acres treated for 1979, 1980, and 1981 were 2367, 6091, and 16170, respectively. This amounts to a second year increase of about 2.5 times and third year increase of almost 3 times.

As a result, in 1981, after 3 years of effort, no-till and reduced tillage were applied to 8350 acres of the Honey Creek watershed - 7% of the total watershed or almost 9% of all cropland within the watershed. In addition, 6500 acres were treated outside the project area.

B. Economics of program implementation.

How much does it cost to accomplish change to conservation tillage systems? Table 2, showing monetary or cost-share incentives paid to cooperators both within the project area and within the 3 counties supporting the Honey Creek effort, provides a partial answer to this question.

In 1979, the first year of conservation tillage demonstrations, Joint Board payment rates for 10-20 acre demonstration plots were set to call farmer attention to the project and to

insure him against, at that time, suspected crop failures. Thus, for limited acreage, landowner payment rates through the Joint Board were quite high, $125 per acre for 140 acres of no-till and $86 per acre for 116 acres of reduced tillage. Cost-share payment rates through the special and regular Agricultural Conservation Programs (ACP) were $28-29 per acre for both no-till and reduced tillage practices. The summary effort, to include estimated acreage done without the benefit of incentive payments, reduced average rates much below the $125 per acre maximum to $23 per acre for no-till and $17 per acre for reduced tillage. In total, $49787 were paid for 2367 acres of conservation tillage, a rate equal to $21 per acre.

In 1980, Joint Board and ACP payment rates dropped to $80 and $25 per acre, respectively. Even with these drops, farmer interest in conservation tillage grew and an estimated 4200 acres were done without payments. As a result, the summary effort brought average rates to $12 per acre for no-till and $3 per acre for reduced tillage. In total, $60567 were paid for 6091 acres of conservation tillage, a rate equal to $10 per acre and a rate decrease of 2 times over 1979.

In the last project year, 1981, Joint Board and ACP rates remained the same as in 1980 except ACP payments for reduced tillage were eliminated, hoping to give greater emphasis to the erosion benefit of no-till. As in 1980, farmer interest continued to expand with an estimated 12900 acres done without benefit of payment assistance. This response brought summary effort rates to new lows of $8 per acre for no-till and $1 per acre for reduced tillage. In total, $101000 were paid for 16170 acres of

conservation tillage, a rate equal to $6 per acre and a rate decrease of 3.5 times over 1979.

Costs other than landowner payment incentives are, however, required to accomplish change to conservation tillage systems. Costs for information-education programs and technical assistance staffing need be included. These three costs can then be balanced at levels necessary to implement tillage change for a given area within a specific time frame. For Honey Creek and in addition to payment incentives, annual expenditures of about $25000 and $35000 were made for information-education and technical assistance, respectively. An unknown question, though, has always been: will the implementation program planned be cost effective in terms of soil and phosphorus loss reductions?

In order to establish cost effectiveness, effectiveness of no-till and reduced tillage practices in reducing soil or phosphorus losses must first be established or estimated, Table 3. For 10-20 acre demonstration plots in the Honey Creek watershed, on those soils having potential yield responses to no-till equal to or greater than conventional tillage either naturally or with artificial drainage, soil loss estimates using the Universal Soil Loss Equation showed that reduced tillage systems decreased erosion rates from 6-7 tons per acre per year (T/Ac/Yr) to 4-5 T/Ac/Yr or by about 30% over the conventional plow systems. On the same soils, but often different fields, no-till decreased erosion rates from 6-7 T/Ac/Yr to 1-2 T/Ac/Yr or about 75%.

With respect to phosphorus yield reductions, the Lake Erie Wastewater Study Methodology Report assumes that application of conservation tillage practices will be from 60-90 per cent effective

Table 3. Average effectiveness of conservation tillage systems in reducing erosion, T/Ac/Yr, and phosphorus transport, Kg/Ha/Yr, for demonstration plots within the Honey Creek Watershed Project.

EROSION REDUCTION

	Conventional Plot	Conservation Tillage			
		Reduced Tillage[a]		No-till	
	T/Ac/Yr	T/Ac/Yr	% Reduced	T/Ac/Yr	% Reduced
1979	7.1	4.3	40		
	6.9			1.4	76
1980	6.8	5.3	22		
	6.1			1.6	74
1981	6.1	4.6	24		
	5.9			1.2	80

PHORPHORUS REDUCTION[b]

Kg/Ha/Yr	Kg/Hr/Yr	% Reduced	Kg/Ha/Yr	% Reduced
0.84	0.63	26	0.30	64

a. Chisel plow, disk, field cultivate, etc.
b. At relative effectiveness of 85%, reduced tillage erosion reduction of 30% and no-till erosion reduction of 75%.

in reducing total particulate phosphorus transport relative to reduction of erosion. In his study,"The Effects of Reduced Tillage on Phosphate Transport from Agricultural Land,"Logan reported an effectiveness ratio of 89%. These ranges of possible reductions are based on the fact that most phosphorus moves attached to the clay fraction of river sediment loads, and that while reduced tillage practices may increase the proportion of clay sized particles in runoff, significant reductions in phosphorus transport can still occur.

For a relative effectiveness than of 85%, reduced tillage systems in the Honey Creek watershed would potentially decrease phosphorus transport from a present watershed condition of 0.84 kilograms per hectare per year (Kg/Ha/Yr) to 0.63 Kg/Ha/Yr or by 26%. No-till would decrease phosphorus transport from 0.84 to 0.30 Kg/Ha/Yr or by 64%.

By combining these estimates of practice effectiveness with acre accomplishment data of Table 2, total erosion and phosphorus reductions can be calculated for each of the 3 program years. Then by knowing annual program costs for each year, estimates of program effectiveness can be made in terms of dollars per ton ($/T) of soil or dollars per kilogram of phosphorus ($/KgP) kept on the land or out of Honey Creek, Table 4. Scrutiny of the table shows that unit costs were greatest during 1979, $10/T and $270/KgP. Unit costs were lowest in the final project year, 1981, $3/T and $56/KgP. Average unit costs for the 3 year period were $4/T of soil and $89/Kg of phosphorus.

Realistically, these investment costs would be less since, as a result of the special effort, farmers should continue conserva-

Table 4. Conservation tillage program costs in relationship to erosion and phosphorus reductions.

	Total Program Costs[1.]	Total Erosion Reduction, Tons[2.]	Total Phosphorus Reduction, Kg[2.]	Program Costs $/Ton	Program Costs $/Kg
1979	$110000	10504	407	10	270
1980	121000	22711	1107	5	109
1981	161000	61507	2896	3	56
Program Totals	$392000	94722	4410	4	89

1. Annual costs include: $25000 information-education, $35000 technical assistance plus landowner payment amounts from the Honey Creek Joint Board, Special ACP, Regular ACP.

2. Reductions from both no-till and reduced tillage practices. Combines acre data of Table 3 with erosion and phosphorus reduction of Table 2.

tion tillage farming to some degree even after project discontinuation. To obtain an idea of exactly how much less costs would be, several scenarios can be developed to portray the extent of conservation tillage continuation for some fixed period, say 20 years after project conclusion. These scenarios may then be used to revise downward unit investment costs of the 3 year implementation effort:

Scenario 1. Application will remain constant.

Over the next 20 years, acres treated with conservation tillage (no-till and reduced tillage) will remain at a level to maintain the soil and phosphorus loss reductions for project year 1981: 61507 tons and 2896 kilograms, Table 4.

Scenario 2. Application will decrease by half.

Over the next 20 years, acres treated with conservation tillage will decrease to a level to reduce by one-half the soil and phosphorus loss reductions for project year 1981.

Scenario 3. Application will double.

Over the next 20 years, acres treated with conservation tillage will expand to a level to increase by 2 times the soil and phosphorus loss reductions for project year 1981.

Scenario 4. Application will expand five-fold.

Over the next 20 years, acres treated with conservation tillage will expand to a level to increase by 5 times the soil and phosphorus loss reductions for the project year 1981.

Assuming, then, these benefits to be largely a function of the Honey Creek demonstration effort alone, unit costs over the 20 year period would change as shown in Table 5.

Table 5. Program cost effectiveness in terms of erosion ($/T) of soil and phosphorus ($/KgP) reductions for 4 scenarios portraying various levels of continued conservation tillage implementation over the 20 years following project completion.

Scenario	Program Cost Effectiveness $/T	$/KgP
1. Implementation remains constant	0.32	6.77
2. Implementation decreases by half	0.64	13.54
3. Implementation doubles	0.16	3.38
4. Implementation increases five-fold	0.06	1.35

Thus, under the most optimistic scenario, program cost effectiveness could be as low as $.06/T of soil or $1.35/KgP kept on the land and out of the water. The least optimistic scenario would still measurably increase program cost effectiveness, reducing costs to $.64/T of soil and $13.54/KgP.

C. Economics for the farmer.

Through history tillage practices and more specifically plowing have been an integral step in the production of field crops. While in recent years farmers have begun to employ reduced tillage methods (chisel plow, off-set disc, field cultivate) to replace traditional plowing, change in this direction has been slow, particularly from the standpoint of reducing tillage enough to retain sufficient quantities of crop residue for erosion control. Thus, farmer acceptance of conservation tillage, a variety of relatively new and unproven practices which leave all or major portions of previous crop residues on the soil surface at planting, cannot be expected to be rapid or complete within a short period of time. Will and Ariel Durant in their book, The Lessons of History, make this point quite clear:

"Out of every hundred new ideas ninety-nine or more will

probably be inferior to the traditional responses which they propose to replace. No one man, however brilliant or well-informed, can come in one lifetime to such fullness of understanding as to safely judge and dismiss the customs or institutions of his society, for these are the wisdom of generations after centuries of experiment in the laboratory of history."

The fact is, changes in tillage systems tamper with the economic livelihood of farmers, and in return with the economic strength of agriculture. As a result, "new" conservation tillage systems must be proven or demonstrated if they are to become effective agents of erosion control and related water quality enhancement.

A major purpose of the Honey Creek project was to work closely with farmers in demonstrating practical, workable conservation tillage practices, ones that would provide water quality benefits yet enable maintenance of farm incomes. A key indicator of success of these best management practices is, of course, crop yield, or how well did the "new" method compare with the old?

Table 6, presenting average corn and soybean yields from Honey Creek tillage demonstration plots, provides a partial answer to this question. For corn, during 1979-1981, plow system yields averaged 3.4 bu/ac above reduced tillage yields and 13.1 bu/ac above no-till yields in field sized demonstration plots. For no-till, yields seemed to vary significantly with rotation. For example, no-till corn after alfalfa consistently outyielded most other rotations while corn after corn, corn after soybeans and corn after wheat (except for 1981) produced no-till yields comparable to those of plow yields. The surface application of urea as the sole nitrogen source in 3 plots in 1979 and the introduction of rye cover crops into corn after corn and corn after soybeans clearly reduced yields. When plots employing these practices

Table 6. Average corn and soybean yields by tillage system and by rotation for no-till demonstrations, 1979-1981, Honey Creek Watershed Management Project

CORN

Tillage system and rotation	Yield, bu/ac (no. of plots) 1979	1980	1981	3 year* Average
No-till corn after:				
Corn	135.3 (5)	120.3 (9)	113.4 (9)	120.9
Corn, cover crop	-	-	96.2 (4)	96.2
Soybeans	117.1 (1)	118.9 (4)	118.0 (2)	118.4
Soybeans, cover crop	-	107.9 (9)	92.9 (7)	101.3
Wheat, clover sod	123.3 (9)	127.8 (4)	93.7 (4)	117.4
Alfalfa	117.7 (1)	143.7 (1)	136.3 (1)	132.6
Rye crop	-	-	103.7 (1)	103.7
No-till, all rotations	126.3(16)	118.0(27)	103.8(28)	114.3
No-till, excluding Urea-N and cover crop plots	134.1(13)	123.0(18)	110.1(17)	121.4
Reduced	140.8 (9)	118.0 (7)	114.8(12)	124.0
Plow	137.8 (2)	135.6(13)	116.9(12)	127.4
No-till success ratio[1]. all comparison plots	-	58%	56%	57%

SOYBEANS

Tillage system and rotation	Yield, bu/ac (no. of plots) 1979	1980	1981	3 year* Average
No-till soybeans after:				
Corn	49.1 (1)	50.9 (6)	41.3 (4)	47.2
Corn, cover crop	-	-	47.2 (3)	47.2
Soybeans	42.1 (1)	48.2 (2)	38.9 (1)	44.4
No-till, all rotations	45.6 (2)	50.2 (8)	43.2 (8)	46.6
Reduced	39.9 (3)	40.8 (1)	45.2 (2)	41.8
Plow	41.0 (1)	48.2 (5)	43.2 (6)	45.1
No-till success ratio [2]. all comparison plots	-	100%	80%	90%

1. No-till yield equal to comparison plow yield ± 10 bu/ac.
2. No-till yield equal to comparison plow yield ± 4 bu/ac.

*During the project growing season rainfall was above average in each of the 3 years: 1979: +6.0 inches; 1980: +1.8 inches; 1981: +9.3 inches.

were excluded, no-till yields averaged only 6 bu/ac less than plow system yields. However, for side by side comparison plots, no-till yields were within 10 bushels (plus or minus) of conventional plow yields more than half (57%) of the time.

Yield variations from plow averages were in large part due to a combination of drainage plus the type and amount of crop residue on the soil surface at planting. Under cool, wet conditions, in fields of less than ideal drainage, excessive amounts of crop residues (previous crop mulch plus cover crop, unbaled wheat, straw, etc.) caused surface soil to remain cooler and wetter than in conventional comparisons, resulting in reduced emergence and greater losses of nitrogen applied. Under warm, dry conditions, excessive amounts of crop residues prohibited surface applied nitrogen forms, particularly urea and liquid urea-ammonium nitrate, from contacting the soil, thus permitting nitrogen losses through volatilization. Plots having reduced amounts of crop residue through either tillage or residue management (bale straw, plant no cover crop, etc.) and plots having known nitrogen reserves from previous crops (e.g., alfalfa) almost consistently produced corn yields approximating those of conventional plow yields. Apparently, under these conditions, reduced amounts of residue maintained conservation tillage yields due to improved conditions for soil warming and drying during spring and greater opportunity for surface applied nitrogen to contact and be held by the soil.

For soybeans, 1979-1981, no-till yields averaged 4.8 bu/ac above reduced tillage yields and 1.5 bu/ac above conventional plow yields. In no-till rotations, beans after corn produce yields typically higher than beans after beans. In 1981, no-till beans into a rye cover crop after corn increased yield over beans after corn alone. Rye residue on the soil surface during a dry August appeared to reduce moisture stress on

plants and, as a result, improved crop maturation. For side by side comparison plots, no-till yields were within 4 bushels (plus or minus) of conventional plow yields almost all the time (90%). In only one instance did plow yield exceed no-till by more than 4 bu/ac.

Avoidance of problems relating to drainage was a key factor in the success of no-till soybeans. Beans, normally planted later than corn, were not subject to the stress of cool, wet seedbeds, nor, like nitrogen for corn, were beans subject to loss of a critical plant nutrient. As well, moisure conservation resulting from the presence of crop residues in late summer may have helped improve no-till yields over conventional.

The ultimate indicator of success of a new tillage system is net return, or how do costs of one system vary with another? Table 7 shows that for corn, 1979-1981, net return per acre for conventional, reduced and no-tillage systems averaged $57, $38 and $24, respectively, for demonstration plots within the Honey Creek watershed. While production costs ran from $239 per acre for reduced tillage, to $247 per acre for no-till to $255 per acre for conventional, crop value ranged from $271 per acre for no-till, to $277 per acre for reduced tillage to $312 per acre for conventional. Low production costs for reduced tillage crops coupled with high crop values for conventional crops combined to give the average 3 year economic advantage to conventional corn, $19 per acre over reduced tillage, $33 per acre over no-till.

As before, when urea and rye cover crop plots were excluded from analysis, no-till economics improved significantly. Crop value increased by $18 to $289 per acre, while average production cost decreased by $4 to $243 per acre. As a result, net return increased by $22 to $46 per acre, a return only $11 per acre less than that from

Table 7. Average per acre crop values, production costs and net returns to farmers from conventional plow, reduced tillage, and no-till systems for CORN, 1979-1981, Honey Creek demonstration plot data.

Tillage System	Conventional			Reduced			No-till			No-till[2]		
Year	1979	1980	1981	1979	1980	1981	1979	1980	1981	1979	1980	1981
Number of plots	2	13	12	9	7	12	16	27	28	13	18	17
Crop value, $/Ac	288	387	235	300	335	226	270	335	209	286	350	228
Range - low	269	321	162	253	271	127	166	231	84	235	281	166
- high	307	506	314	381	418	331	324	438	295	324	438	295
3 year AVERAGE		312			277			271			289	
Production costs $/Ac.[1]	224	253	263	193	255	265	208	251	267	210	249	263
Range - low	220	225	210	150	227	237	157	216	205	157	216	205
- high	228	290	293	228	295	286	245	299	305	245	299	305
3 year AVERAGE		255			239			247			243	
Net return, $/Ac	64	134	-28	107	80	-39	62	84	-58	76	101	-35
Range - low	42	55	-108	63	19	-130	-36	-10	-186	40	35	-90
- high	87	224	56	179	191	71	129	200	40	129	200	40
3 year AVERAGE		57			38			24			46	

1. Excludes land cost.
2. Excludes plots where either urea-N only was surface applied as the sole nitrogen source or plots where rye cover crops were seeded the fall before planting.

conventional corn.

Negative net returns for corn during 1981 were not a function of tillage, but rather a function of low market prices, low yields due to excessively wet weather plus late planting and increased costs of drying high moisture grain. Even with these conditions, relative net return by tillage system remained about the same.

Table 8 shows that for soybeans, 1979-1981, net return per acre for conventional, reduced and no-tillage systems averaged $151, $127 and $170, respectively. While production costs varied from $141 per acre for reduced tillage, to $148 per acre for no-till to $155 per acre for conventional, crop value ranged from $268 per acre for reduced tillage, to $306 per acre for conventional to $318 per acre for no-till. Relatively low production costs and high crop value combined to give the average 3 year economic advantage to no-till soybeans, $12 per acre over conventional, $50 per acre over reduced tillage beans.

Regardless of final farmer successes, certain production costs were required to help insure achievement of yield goals and related profits. Table 9 shows that for both corn and soybeans, material and machinery costs varied considerably with tillage system. For corn, material costs were about $16 per acre greater for no-till than for reduced tillage or conventional. In most cases, this added cost was due to recommended use of a contact herbicide* plus the use of an insecticide (usually Toxaphene) for armyworm control in plots with rye cover crops. On the other hand, machinery costs for no-till were $10 per acre less than for reduced tillage and $22 per acre less than for

* Contact herbicides such as Paraquat or Roundup, much like plowing, provide initial control of existing vegetation. Residual herbicides, applied in all tillage systems, subsequently provide control of all new or sprouting weeds.

Table 8. Average per acre crop values, production costs and net returns to farmers from conventional plow, reduced tillage and no-till systems for SOYBEANS, 1979-1981, Honey Creek demonstration plot data.

Tillage System	Conventional			Reduced			No-till		
Year	1979	1980	1981	1979	1980	1981	1979	1980	1981
Number of plots	1	5	6	3	1	2	2	8	8
Crop value, $/Ac	253	360	269	246	306	283	284	376	269
Range - low	-	322	242	156	-	269	263	334	243
- high	-	389	333	293	-	297	306	409	312
3 year AVERAGE		306			268			318	
Production costs, $/Ac.[1]	127	139	175	139	118	156	124	149	152
Range - low	-	116	137	124	-	154	124	111	129
-high	-	176	234	169	-	158	124	182	239
3 year AVERAGE		155			141			148	
Net return, $/Ac.	126	221	94	107	188	127	161	227	117
Range - low	-	161	12	-13	-	115	139	178	4
-high	-	269	196	169	-	139	182	291	183
3 year AVERAGE		151			127			170	

1. Excludes land cost.

Table 9. Average per acre material and machine costs to farmers, by tillage system, for corn and soybean production, 1979-1981, Honey Creek demonstration plot data.

Tillage System	Costs, $/Ac.	1979 Corn	1979 Soybeans	1980 Corn	1980 Soybeans	1981 Corn	1981 Soybeans	3 year AVERAGE Corn	3 year AVERAGE Soybeans
No-till	No. plots	16	2	27	8	28	8		
	Material[1]	162	80	200	106	215	112	197	106
	Machinery[2]	46	44	51	43	52	41	50	42
Reduced	No. plots	9	3	7	1	12	2		
	Material	139	96	195	63	200	108	179	94
	Machinery	53	44	60	55	65	48	60	47
Conventional	No. plots	2	1	13	5	12	6		
	Material	155	78	181	78	191	113	183	95
	Machinery	69	49	72	61	72	62	72	60

1. Material costs include seed, lime, fertilizer, herbicides, insecticides and interest on operating capital.

2. Machinery costs include custom rates for tillage, planting, harvesting, trucking and application of fertilizers, herbicides and insecticides.

conventional. These cost differences were a direct function of the type and intensity of tillage performed. For soybeans, material costs were about $11 per acre greater for no-till than for reduced tillage or conventional. This added cost was almost always due to the recommended use of a contact herbicide. Machinery costs for no-till soybeans were $5 per acre less than for reduced tillage and $18 per acre less than for conventional. Again, differences were a function of degree of tillage. In summary, increased material costs for no-till crops were more than offset by reduced machinery costs when compared to conventional tillage systems. Optimal savings occurred in reduced tillage systems where both material and machinery costs tended to be lower.

Thus, tillage demonstrations within the Honey Creek watershed have shown that a change to conservation tillage need not necessarily harm farm income. Average net returns from no-till soybeans even exceeded those of conventional soybeans, and returns from no-till corn approximated those of conventional where poor drainage and/or excessive amounts of crop residues did not combine to reduce yields. Drainage of wet fields, selection of drier fields for no-till corn and management of residues to minimize excesses are steps that would lead to consistently improved no-till corn yields in the future.

"So the conservative who resists change is as valuable as the radical who proposes it--perhaps as much more valuable as roots are more vital than grafts. It is good that new ideas should be heard, for the sake of the few that can be used; but it is also good that new ideas should be compelled to go through the mill of objection, opposition, and contumely; this is the trial heat which innovations must survive before being allowed to enter the human race."

From: "The Lessons of History"
Will and Ariel Durant

VII. PROGRAM EVALUATION - KEY MANAGEMENT DECISIONS

Four methods or techniques were used during the 3 year project to evaluate performance for the purpose of improving effectiveness. These were:

1. On going evaluation. Essentially self-explanatory, this evaluation was done by the Joint Board and staff, the Interagency Advisory Group and county task force members as the Project proceeded. Situations requiring resolution in order to continue work efforts were ultimately reviewed by the Joint Board. Based upon inputs from parties involved, a decision was then made by the Board.

2. Program evaluation survey. Upon completion of work the first year, 1979, a program evaluation form was designed and mailed to all persons having significant project involvement, specifically Interagency Advisory Group members, task force representatives and farmer cooperators. Individuals were able to evaluate accomplishments in key project areas such as coordination, information-education, financial incentives, demonstrations and technical assistance by checking any one of five different responses for the key area: outstanding, very good, good, fair, and weak. Of 64 forms mailed, 26 were returned. Results were tabulated to help the Joint Board make plans for years 2 and 3 of the contract.

3. Program development. Based on experience gained the first year, the Joint Board was to prepare a program of work for years 2 and 3. This contract task necessitated combining the collective wisdom of all Interagency and task force members in order to evaluate the initial contract or approach for BMP implementation and to recommend a two-year workplan. A series of meetings with agency representatives and task force members were required to successfully complete the workplan. Once completed, however, participants were aware of future

Project direction and their role in achieving accomplishment of tasks planned.

4. Farmer Survey - Upper Honey Creek. As a result of the previous exercise, it was recommended to the Joint Board that a survey of Upper Honey Creek farmers be made during 1980 to help interpret field inventory data collected and to assess farmer understanding and acceptance of conservation tillage BMP's. Thus, with the assistance of CES and OSU, a survey questionnaire was designed and mailed to about 90 landowners and operators within the 11,000 acre Upper Honey Creek watershed. Just over 30 responses covering about one-third of the watershed area were received by the Board. Results, summarized in a paper by Ray Schindler and Walter Schmidt of CES, were used by the Board to refine and improve efforts aimed at conservation tillage BMP implementation.

Numerous policy decisions or program changes resulted from these four methods of evaluation. Perhaps the most significant program modification, based on initial assumptions about Project organization and operation, was the decision during early 1979 to hire a full-time person to assist with implementation of conservation tillage BMP's. After several months of operation, however, it had become evident to task force and Joint Board members alike that in order to fulfill contractual obligations (i.e., to successfully demonstrate reduced tillage and no-till BMP's), it would be necessary to secure additional manpower--manpower that could extend in a practical and experienced manner existing knowledge about conservation tillage to farmers.

Reaching a decision to seek added manpower was not easy. Such a change would require contract modification and lead toward the creation of a Project staff, something the Board wished to avoid if at all possible.

Initiating a Project staff could detract from the concept of existing agencies doing the water quality job and leave the public with the impression that a new group had been hired and funded to help improve Lake Erie water quality. In final analysis, it was evident that the Project had created sufficient quantities of new work that simply couldn't be done with existing manpower. The Board requested a contract modification. It was approved by the Army Corp and a project conservationist was hired.

Other important decisions or changes resulting from program evaluations were:

1. Decision to perform water quality monitoring. At several of the initial meetings in the Upper Honey Creek watershed, landowners frequently questioned the significance of phosphorus loads from agricultural sources as compared to phosphorus loads from septic systems in Tiro, a small community in the watershed. Later, the Project staff and local residents and USDA agency representatives felt that a continuous recording stream flow, water quality station at the outlet of Upper Honey Creek should be installed to enable future detection of water quality changes and to permit validation of water quality models (e.g., ANSWERS Model) requiring use of field tested cellular inventory data. Because of these concerns and recommendations, the Joint Board sought assistance to perform water quality monitoring that would resolve, with local data, the phosphorus loading issue and gather baseline data for detecting change and testing models. After several letters and meetings, staff from Heidelberg College agreed to evaluate the loading question and Heidelberg College, OEPA and U. S. Geological Survey (USGS) representatives cooperated to install a monitoring station at the outlet of Upper Honey Creek.

2. Decision to lease a no-till planter. It was initially expected that sufficient planters would be available to plant reduced tillage and no-till demonstration plots. While some planters were available, they could not always be easily used by other farmers wishing to have demonstration plots. Logistics at planting time required the availability of a planter that could be used solely for tillage plot work. Thus, planters were leased from dealers and provided free of charge to farmers needing them. One planter was secured the first year for Upper Honey Creek use, two the second year as the project expanded throughout the watershed but only one the third year as planter availability became less of a problem. The leased planters also made it much easier to work with any or all landowners since lack of a planter could not be used as a reason for not trying conservation tillage.

3. Need for more direct inclusion of USDA, SWCD and CES area level managers in project planning. The organizational concept keyed on state and local level involvement. Area level managers were not at first involved in many of the project planning activities--Interagency or county task force meetings. Realizing this, area managers were subsequently invited to participate where appropriate in such meetings. Several meetings of project staff and the SCS/Corps liaison were also held with area managers alone to explain Project purpose and ask their help and advice in completing Project tasks.

4. Need for stressing fertility management as a part of conservation tillage BMP's. Work with landowners and results from the Upper Honey Creek survey indicated that many farmers could do a much better job of fertilizing for crop production, especially when considering ways to reduce nutrient runoff. As work progressed more emphasis was

placed on fertility management as a key component of conservation tillage BMP's.

5. Decision to organize separate county task forces. When the program expanded from Crawford to Seneca and Huron counties, it was necessary to determine whether to have separate task forces in each county or a joint task force with representatives from all counties. Since it was felt Project activities could best be done by maintaining the identity of existing county level work arrangements, individual task forces were organized. In the fall of each year, however, representatives of all task forces met to review Project status and to suggest "mid-course corrections" that would improve the program the following year.

6. Need for a seminar addressing relationships between reduced tillage practices and drainage. Because of the need to have adequate drainage before implementing reduced tillage on many north-central Ohio soil types, there was a constant concern among some farmers, Joint Board members and others about how reduced tillage would impact drainage and vice-versa. Due to this concern, the Joint Board wrote letters to the Corp of Engineers and CES requesting technical information about the matter. CES officials suggested a seminar be held for SCS, SWCD and CES technical personnel to present current knowledge about tillage-drainage relationship. While all agreed that the seminar would be beneficial, it has not yet been held.

7. Decision to hire a project technician. One recommendation resulting from preparation of the 2-year program of work was to hire a project technician to help emphasize and complete engineering BMP's. Again after much deliberation by the Joint Board, a project technician was hired after work program approval by the Corps.

8. Decision after the first year to reduce land rent and cost payments to cooperators with tillage BMP's. High incentive payments the first year (up to $125 per acre for 15 acres of no-till) were necessary to stimulate interest among farmers. The second year such payments were not required. Maximum payments did remain at $80 per acre for 10 acres of no-till since landowners were also asked to be present on tours, keep fields accessible for public viewing and participate in farmer panels or discussion at workshops.

9. Need to add 8-10 new cooperators each year. While there was a strong desire among most farmers to see no-till done in the same field for 3 years, task force members and the Joint Board perceived the need to also add new cooperators each year. As a result more farmers were able to experience BMP application on their farms and word about how the practice worked spread more quickly.

10. Need to work with various agri-business representatives. To avoid showing favoritism to a single company or dealer and to encourage greater involvement of agri-business in Project work, CES representatives suggested that the Board and staff work with all appropriate custom applicators, seed dealers, chemical companies, etc.

11. Decision to modify CES role in development of Joint Board, landowner tillage plot agreement sheets. It was initially agreed that CES would approve or disapprove technical aspects of tillage agreement sheets. Since, however, in a practical sense it was sometimes difficult to complete tillage demonstrations exactly as outlined by the agreement, CES agents and agronomists felt reluctant to accept responsibility for recommendations subject to change.

For example, a farmer may have failed to obtain the recommended seed treater, thus necessitating a substitution the day of planting. In other instances, a farmer may have wished to plant a familiar seed variety, but one not recommended by CES agronomists. Because of these possible variations from agreement sheet recommendations, a meeting was held to resolve the concern of CES. From the meeting it was decided that the CES role would shift slightly from one of approval/disapproval to one of review/comment. This change insured continued inclusion of CES technical input to agreement development, yet provided project staff some latitude with practice implementation. In turn, the Joint Board gained a greater responsibility for practice recommendations.

12. Decision to install a visual means of comparing soil loss from conventional plow versus no-till fields. In addition to Universal Soil Loss Equation estimates, the Joint Board felt it important to demonstrate more vividly soil loss reductions with no-till. This was done by collecting runoff from two 20 square foot portions of a plot demonstrating no-till versus conventional farming. Results were reported to the Joint Board and area farmers.

13. Need for controlled research plots documenting the economics of conventional versus conservation tillage systems. CES representatives in particular were concerned about the potential use of economic data derived from demonstration plot work. Specifically, they were concerned about conclusions that might be drawn from data developed without the benefit of statistical design. Thus, during the last year of the project, CES agreed to begin replicated plot work on representative watershed soils in order to generate data to better assess the economics of conventional versus conservation

tillage farming methods. Work is not complete at this time.

14. Need for familiarity of agency personnel with practical aspects of conservation tillage methods to include basic no-till planter adjustment. At one meeting of area level managers and at several Joint Board meetings, it was suggested county SCS, CES, and SWCD personnel should become familiar with practical aspects of conservation tillage so that during and especially following the Project, expertise other than the project conservationist would be available to help farmers starting out with reduced tillage or no-till. While agency oriented conservation tillage workshops were suggested to help develop greater expertise, none were organized. Rather, agency personnel increased their knowledge of conservation tillage by working with the project conservationist and by attending workshops or tours planned by county task forces, other neighboring counties, CES-OSU, local custom applicators and Chevron Chemical Company. Such training, supported by the Joint Board, will be of great importance as more farmers seek technical help with conservation tillage.

15. Decision to shift project technician responsibilities. Project technician was hired to place greater emphasis on engineering BMP's by providing survey-design assistance to existing SCS-SWCD staffs. As his knowledge of the job grew, it was apparent that in certain instances he could also help with landowner contact-assistance work. Thus, during the second year, the Joint Board gave the technician responsibilities beyond those initially set forth. While a relatively small change, it was one requiring Board deliberation since more responsibility became concentrated within the project staff. The technician did, though, continue to work closely with district

personnel and to utilize SCS technical guidance or practice specifications in any discussion with cooperators.

16. Decision to purchase straw mulch crimper. During the project, waterway establishment became a concern, particularly in parts of Crawford county where on several occasions heavy rains severely eroded newly constructed waterways resulting in poor examples of best management practice. Aware of this need and while attending a training session for district technicians, the project technician learned about the use of mulch crimpers in strip mine reclamation work. He suggested that a crimper be obtained to help demonstrate proper waterway establishment. The Joint Board agreed and helped the Seneca SWCD share the cost of a crimper for use throughout the Honey Creek watershed.

17. Need for publication describing basic concepts or principles of conservation tillage. As the project progressed, task force members and project staff realized the need for a single document or publication that would enable farmers to determine how and where conservation tillage would fit their operation best. From this realization, CES agronomists Don Eckert and Walter Schmidt, with input from the project conservationist, authored a booklet to fill the need, "Using Conservation Tillage in North Central Ohio."

18. Decision to initiate an Upper Honey Creek farmer survey. To gain information to interpret data gathered through the cellular inventory of Upper Honey Creek and to gather data that would more effectively direct efforts to accelerate BMP adoption, the SCS/Corps liaison with support from the Crawford task force recommended that a questionnaire be designed and mailed to Upper Honey Creek farmers. The Board agreed and survey results were used to refine and improve

efforts aimed at conservation tillage BMP implementation.

19. Decision to modify budget to reflect 1979 contract modifications and input from work planning for 1980 and 1981, Table 10.

Table 10. Honey Creek Watershed Program Budget by Task, 1979 to 1981.

	1979 (9 mo.)	1980	1981 (15 mo.)	Total
Information-education	$ 11000	$ 26000	$ 21000	$ 58000
Contact-assistance	3000	12000	11000	26000
Recommend demonstrations	2000	2000	10000	14000
Demonstration application payments	30000	20000	25000	75000
Inventory/BMP needs	17000	12000	-	29000
Program formulation and evaluation	4000	5000	22000	31000
Implement demonstrations	28000	46000	54000	128000
	$ 95000	$123000	$143000	$361000

VIII. IMPRESSIONS AND OBSERVATIONS

The following impressions and observations, while not always supported by specific facts or data, do reflect important thoughts and ideas experienced by the Joint Board during Project administration. These impressions and observations may be quite useful to those planning implementation of nonpoint source control programs, especially where programs employ conservation tillage as a best management practice.

A. Administration - operation

1. Programs for implementing BMP's can probably be run most effectively if administered within a single county. Multi-county arrangements were possible but led to inefficiencies (additional Board meetings, more coordination, etc.) and caused problems with supervision of technical staff serving both counties. Single county programs can readily utilize existing organizational arrangements to include lines of communication and lines of authority.

2. Existing USDA agencies were reluctant to voluntarily commit the type of manpower necessary to accomplish contact-assistance and demonstration work, particularly with conservation tillage BMP's. Project staff were hired to complete these tasks. Possibly, sub-contracting with individual USDA agencies could have achieved the same result. However, a shortage of persons with knowledge of no-till and reduced tillage may have contributed to the reluctance.

3. USDA agencies, on the other hand, were quite effective in performing work routinely or normally done by the agency, e.g., special cost share incentives to accelerate BMP acceptance, guidance of Joint Board and staff based on familiarity with farmers

and county agricultural programs, spear-heading educational activities such as radio shows, field tours and workshops, research data in support of conservation tillage practices, survey and design specifications for engineering BMP's.

4. Location of project staff within the Tiffin office, Seneca County, enabled farmers throughout Seneca County to benefit more from Project activities than farmers throughout Huron and Crawford Counties. These greater benefits to Seneca farmers were largely a function of distance and the fact the Seneca farmers frequented the Tiffin office for a variety of other agricultural services.

5. Some "up-front" monies will be required to get things started in most special efforts emphasizing conservation tillage. Many counties do not normally have funds readily available to hire additional personnel or secure no-till planters to encourage adoption.

6. Minimal amounts of paperwork were required by the Corps of Engineers-Joint Board contract. As a result, the Board had great freedom in administering the Project and the staff had more time to spend on actual task work. Such flexibility is not necessarily the case in some USDA programs, e.g., the Rural Clean Water Program.

7. If the quality of technical assistance is low, cost share for conservation tillage implementation will be more important. In such cases, special cost share or cost share through ASCS should be anticipated for at least minimal acreage for a period of 1 to 3 years (preferably 3 years), hopefully in the same field.

8. Where little no-till activity has occurred previously, local agencies should work through equipment dealers to insure availability of a no-till corn planter or perhaps a no-till drill. Farmers could be expected to pay an acre fee for use of such equipment.

9. A task force should be organized to help guide the program. As a minimum, members should include: County Extension Agent, ASCS County Executive Director, SCS District Conservationist plus 2 or 3 farmers who are interested in conservation tillage or who are already doing conservation tillage successfully.

10. To begin a program from scratch, about $20-30 thousand per county per year will be needed from some source if a reasonable success rate is expected. If salary of the conservation tillage technician is low, money might also be used for cost share on demonstration fields. Costs to consider are:

Item	Annual Cost Range
Tillage technician	$15,000 - $20,000
Vehicles	2,000 - 4,000
No-till planter	0 - 3,000
Information-education materials	0 - 2,000
Cost share incentives	0 - 5,000
Administration-Operations	2,000 - 3,000

11. Ways to document acres of no-till or reduced tillage accomplishment should be sought, e.g., acres of demonstration fields, ASCS cost share records, random county-wide field surveys, etc. Data like this is needed to evaluate program effectiveness.

12. Program status should be reviewed at each meeting of the board, agency or special group adminstering the program. Keep program priority high.

B. Conservation Tillage Demonstrations

1. A minimum of 10-15 demonstration fields per year would normally be sufficient to test suitability of no-till or ridging in a given county. In addition to these demonstrations, a tillage technician should be able to assist 20-30 other farm operators.

2. Demonstration fields should be a minimum of 10-15 acres in order to evaluate tillage results with respect to field variability.

3. Demonstrations of conservation tillage BMP's should emphasize quality crop stands (excellent emergence and weed control) conducted under a variety of common residue and cropping situations.

4. Early program support from key farmers, chemical company representatives and custom spray applicators can contribute significantly to success of conservation tillage demonstrations.

5.One-to-one contacts between farmers and a tillage technician is undoubtedly the best way to begin implementing reduced and no-tillage practices, particularly in areas where such practices are uncommon. Over a period of 3 years, for example, a tillage technician can help many farmers adapt conservation tillage to their farming operation. These farmers, in turn, discuss the practices with neighbors and often help them get started by sharing planters or tillage equipment. For continuing emphasis on conservation tillage, one-to-one contacts with farmers will still be needed to train second generation conservation tillage operators and to keep those already converted abreast of current technology.

6. A conservation tillage technician (or a successful no-till farmer) should always be present when a new operator starts planting no-till for the first time. Seeds must get into the soil

correctly and the operator needs to gain confidence in his ability to perfect no-till farming.

7. Program administrators and tillage technicians should not become discouraged when farmers are reluctant to try no-till. Technicians should work with interested farmers first. Change of basic farming methods will take time.

8. While cover crops like rye have several advantages such as soil moisture conservation in summer, erosion control on steeper slopes and creation of firm field conditions in spring, they do have certain disadvantages which can decrease the chances of a successful no-till experience. Green growing cover crops can attract armyworm moths in early spring, provide habitat for worm development and often necessitate spraying with insecticides such as toxaphene to protect corn fields from damage which would severely harm yields. In a wet spring, it may be difficult to control the growth of a rye cover crop. Then when the fields are dry enough to plant, dense, tall stands of rye can interfere with proper planter operation. After spraying, the rye will shade the soil surface and reduce the rate of soil drying, generally keeping the soil cooler and more moist than conventionally tilled soil. For corn, this influence tends to slow germination and plant development and to cause greater opportunity for nitrogen losses. While lower planting rates of rye might be a partial solution to these problems, a first year no-tiller might best start in fields requiring less residue or cover grop management. Another solution would be to plant a wheat cover crop. In a dry spring, wheat, a less vigorous plant than rye, would pose less crop residue problems and tend to attract fewer armyworm moths.

Under extremely wet conditions, no-till planting could be foregone with the wheat being left to mature for grain.

10. All agronomic recommendations are in one way or another based on research data. The need for continued high quality research data is a must. Future research, however, should focus more on reduced tillage and no-till as "standard" or "conventional" systems so farmers can have better knowledge of how conservation tillage can work for them. Two areas in need of research at this time are: (1) ways to insure effective nitrogen utilization in no-till corn and (2) proper use of cover crops (legume, non-legume) in no-till crop production.

C. Personnel and Training

1. Programs designed to accelerate farmer acceptance of conservation tillage will require a minimum staffing of one person whose full-time job is to emphasize conservation tillage. The person need be familiar with all aspects of conservation tillage and be able to respond to the basic technical questions of all farmers.

2. During spring especially, be willing to work when farmers do. Adjust work schedules accordingly or offer compensatory time to conservation tillage technicians.

3. Where tillage technicians may lack knowledge about important aspects of practice application, provide training opportunities to include soil testing, soil fertility, weed identification and control, insect identification and control, planter adjustments, sprayer calibration, etc.

4. At certain times conservation tillage technicians will need call on a higher level of expertise for help. Such expertise

must be available to answer technical questions about practice planning or when things go wrong. The individual providing such expertise should understand the job as priority work. Special programs for implementation might address this issue and consider an area or multi-county agronomist to specifically assist the conservation tillage effort.

5. Conservation tillage technicians will require updating of technical knowledge as new ideas and concepts evolve. Training updates will be needed for the technician to effectively work with the more progressive farmers.

D. Information - education Programs

1. Conservation tillage demonstration fields should be used for farmer tours. To increase benefits of these tours, certain basic data about the fields should be collected and presented at the tours, e.g., drainage, soil type, fertility, herbicides, type of planter, planting date and seed drop, previous crop, residue amounts, cover crop if any, emergence, seed variety, pest problems noted, remedial treatments if any, final stand and crop yield. Rainfall and temperature data plus a conventional tillage comparison would also be quite useful and informative. A conventional check would enable evaluation of soil loss differences as well as agronomic factors.

2. Results from conservation tillage demonstration fields should be known by farmers. Agronomy days, newsletters, news articles, radio shows, young farmer meetings, and perhaps a summary report would be ways to distribute information.

3. Tillage programs should not exclude the youth. For example, include vo-ag students in activities whenever possible: no-till

planting, building a weigh wagon, modifying a planter for no-till, preparing fair displays, etc.

4. Local government officials, county commissioners especially, should view program work and have a basic understanding of the effort.

5. Local newspapers and radio stations should be encouraged to cover program work. Have news media personnel attend tours and workshops.

6. Demonstration fields should have signs so anyone passing will know what practices have been tried in the field. Signs last all growing season and continue to call attention to program work.

7. Enlarged pictures of successful BMP demonstrations hung in agency offices or on bulletin board displays will focus attention on no-till, waterways, erosion control structures and other BMP's.

8. A special brochure describing the program should be mailed to all county farmers. This will increase understanding and acceptance of planned work.

9. Individual postcard mailings should be used to insure maximal farmer attendance at tours and/or workshops.

10. Workshops should be planned to address those aspects of conservation where farmers or custom applicators need help most, e.g., planter calibration or herbicide recommendations or herbicide application, etc.

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APPENDIX A

Description of Contract Tasks

A. Inventory

Watershed inventory was a significent portion of contract work during the first year, 1979. Purpose of the inventory was to collect field reliable data from the 11,000 acre Upper Honey Creek watershed, Crawford County, which could be compared to data already existing within the computerized Land Resources Information System (LRIS) developed by the Army Corps for use in the Lake Erie Study. Examples of data collected from points within each of more than 1100 ten acre cells are: soil type, land use, cover type, time and method of tillage, slope through the point, length of slope, cover or "C" factor for use in soil loss calculations, existing and needed BMP's. Validation of LRIS files containing the same data gathered or estimated from existing resource records or maps was necessary to insure that predictions (ANSWERS water quality model) or calculations (Universal Soil Loss Equation) made using LRIS data were reliable.

Field inventory information was also used to quantify nonpoint sources of pollution that could not be documented using resource records or maps. In addition to identifying livestock concentrations near water courses, soil loss estimates were made for about 11 miles of streambank and 25 miles of roadside. This data along with the cellular information was then used to determine areas in need of priority treatment and specific treatment needs--grassed waterway, erosion control stucture, conservation tillage. During 1980, second year of the Project, inventory data was used to estimate BMP treatment needs and costs for the entire 120,000 acre Honey Creek watershed.

B. Contact and assistance

Landowner contact and assistance, while timewise a relatively small portion of contract work, was essential in putting BMP's out on the ground. Such work permitted the determination of Project cooperators and exactly those practices needed for specific fields. Each year about 20-30 farmers were ultimately identified to help demonstrate reduced tillage and no-till practices. Similarly about 5-10 farmers were identified each year to demonstrate engineering or structural practices.

C. Recommend demonstrations

Recommending BMP demonstrations was a third contractual task. Here the purpose was to identify practices that when applied would improve the quality of agricultural runoff, suggest landowners that might cooperate with application and outline watershed areas most in need of treatment, Figure A1. BMP's the Joint Board was to consider were: minimum, mulch or reduced tillage (1000# or more of previous crop residue on soil surface at planting) no-till, cover crops, grassed waterways, erosion control structures, critical area seedings, streambank stabilization, and sod berms along road or farm ditches.

D. Implement demonstrations

Implementing demonstrations recommended was a significant portion of Joint Board work each year. Purpose of the demonstrations was to show proper application of a variety of practices and to permit evaluation of practice effectiveness and practicality by farmers, agency personnel and agribusiness representatives alike.

Developed as part of this task, annual goals for Joint Board accomplishment were:

Conservation tillage	200 acres	Sod berms	1800 feet
Grassed waterways	1 mile	Critical area seedings	4 acres
Erosion control structures	2 each	Cover crops	50 acres
Streambank protection	1000 feet		

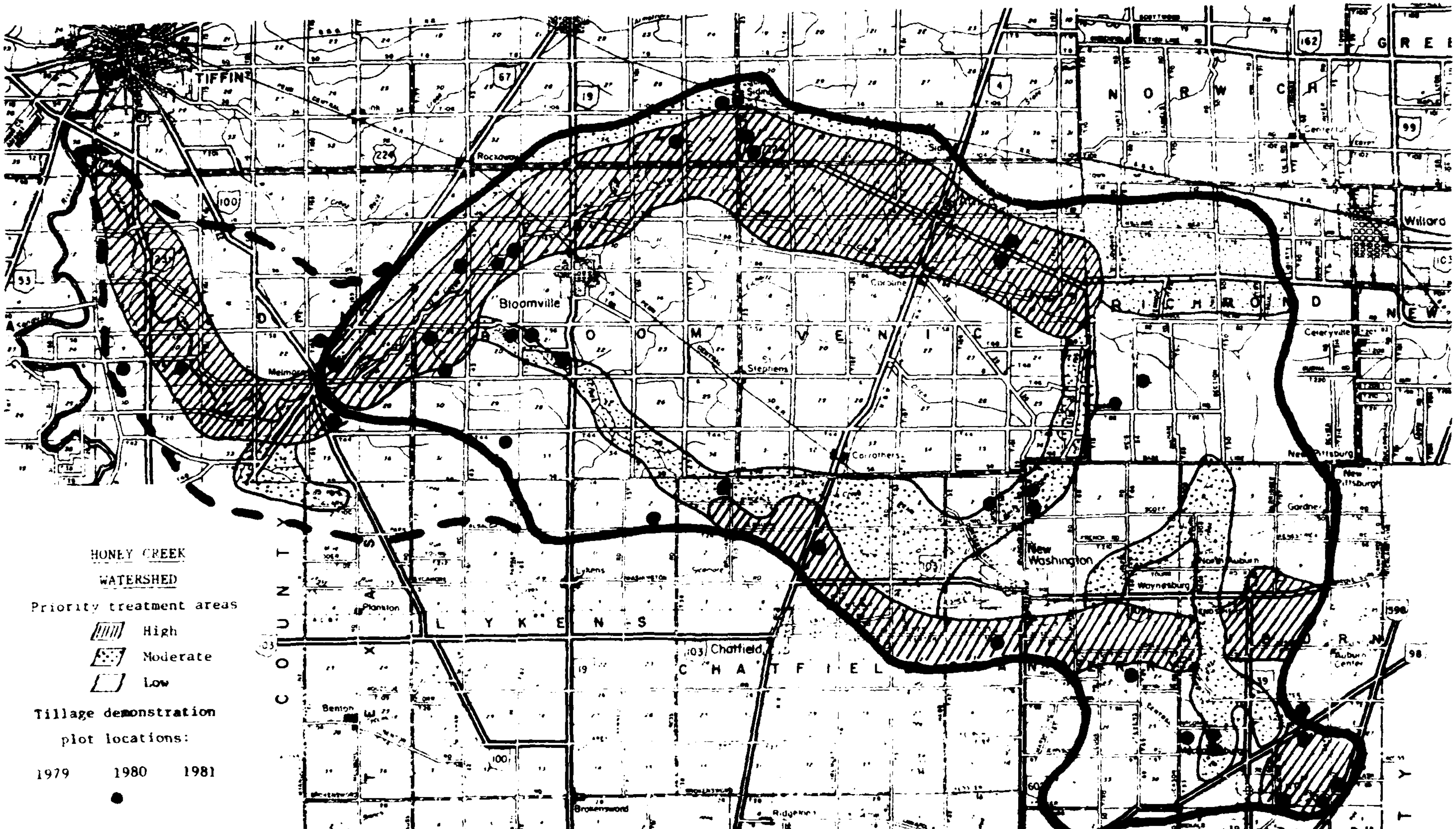

HONEY CREEK
WATERSHED
Priority treatment areas
High
Moderate
Low
Tillage demonstration
plot locations:
1979 1980 1981
TIFFIN
Rockaway
Bloomville
Melmore
St Stephens
Caroline
Carrothers
New Washington
Waynesburg
North Auburn
Chatfield
Lykens
Benton
Willard
Celeryville
New Pittsburg
Gardner
Auburn Center
Desoto
Ridgeton
Brokensword
Sidney
COUNTY

FIGURE A-1

E. Information - education

Information-education was an important task in support of implementation. Activities of this task were to inform local people about the Project, help them better understand the relationships between agricultural operations and water quality and educate farmers about proper BMP application, especially new management steps associated with reduced tillage and no-till farming systems. Information-education efforts were directed first to farmers but as well to USDA agency personnel, agri-business and the general public. Initial work was directed to the Honey Creek watershed area, but later expanded to include neighboring counties, states within the Great Lakes drainage and Ontario, Canada.

F. Program formulation - evaluation

A final task, program formulation and evaluation, served as a feedback or self-regulatory mechanism enabling the Joint Board to modify, adjust or alter Project operations in order to perform contract tasks. During 1979, the Joint Board, working with USDA agencies, was to develop a program of work for the last 2 years of the Project, 1980 and 1981. Throughout the Project, the Joint Board was to evaluate progress, noting areas where changes might lead to greater efficiency or effectiveness. These changes or experiences as documented in this report were and still are intended to be of assistance to others planning to begin similar programs.

APPENDIX B

Project Accomplishment and Method of Accomplishment

A. Inventory

The Upper Honey Creek field inventory, begun in late 1978, was performed by the project manager with procedural and technical guidance provided by the SCS/Army Corps liaison and SCS Area II staff personnel. Prior to beginning the inventory, general news releases about Project purpose and scope were made. As work progressed, each landowner was contacted before collecting farm survey data. Only 2 landowners out of the 70 contacted were reluctant to have their farms surveyed. One felt the project manager to be "nothing more than a glorified welfare worker;" the other was against all government in general. Overall landowner response, however, was very positive and all inventory work was completed.

Field data was collected by walking to a pre-selected LRIS sample point within each of 1100 plus cells, coding data on field sheets or recording tape, then transcribing data to computer key punch forms. Streambank erosion data was gathered by walking the channel upstream to downstream, noting extent and rate of all eroding bank segments on SCS Erosion Inventory Phase II Worksheets (1978-1979 Inventory and Monitoring program). Roadside erosion data was recorded on the opposite side of the same SCS worksheet. Streambank and roadside data were also recorded by cell to enable calculations comparing there nonpoint sources with sheet and rill sources for the same cell.

As of this writing, a computerized analysis comparing Upper Honey Creek (UHC) field data with LRIS data had not yet been completed (9/9/81). However, manual calculations have been done to compare Universal Soil Loss Equation erosion predictions using the two data bases, Table B1. Note that these calculations were done for cropland only and for only the 13 major soil types found within the UHC watershed. The 13 soil types occupy about 80% of the total landscape.

Table B1. Comparison of the Upper Honey Creek (UHC) and Land Resources Information System (LRIS) data bases and the erosion predictions resulting from each.

	Soil Map Symbol	# Cells	R	K	L	S	(LS)	C	P	T/Ac/Yr	Total T/Yr	
LRIS	Bg	38	125	.43	230	1.0	.17	.24	1.00	2.2	836	
UHC					360	2.1	.28	.28	.92	3.9		1482
LRIS	Bp	27	125	.28	340	1.0	.19	.24	1.00	1.6	432	
UHC					240	1.5	.22	.32	.94	2.3		621
LRIS	Co	17	125	.28	310	1.0	.18	.24	1.00	1.5	255	
UHC					315	1.3	.20	.29	.91	1.8		306
LRIS	De	47	125	.43	300	1.0	.18	.24	1.00	2.3	1081	
UHC					260	1.2	.19	.31	.91	2.9		1363
LRIS	Ly	62	125	.32	200	1.0	.16	.24	1.00	1.5	930	
UHC					342	1.2	.21	.33	.93	2.6		1612
LRIS	Pm	31	125	.24	220	1.0	.16	.24	1.00	1.2	372	
UHC					294	2.1	.28	.26	.95	2.1		651
LRIS	To	146	125	.28	500	1.0	.21	.24	1.00	1.8	2628	
UHC					620	1.1	.23	.32	.93	2.4		3504
LRIS	Tr	85	125	.37	210	1.0	.16	.24	1.00	1.8	1530	
UHC					290	1.6	.23	.31	.92	3.0		2550
LRIS	BgB	101	125	.43	215	4.0	.54	.24	1.00	7.0	7070	
UHC					261	2.6	.31	.29	.92	4.4		4444
LRIS	CdB	27	125	.37	160	4.0	.48	.24	1.00	5.3	1431	
UHC					230	3.2	.40	.26	.92	4.4		1188
LRIS	AdC2	10	125	.37	150	9.0	1.40	.24	1.00	15.5	1550	
UHC					229	5.6	.93	.24	.88	9.1		910
LRIS	CdB2	50	125	.37	160	4.0	.48	.24	1.00	5.3	2650	
UHC					287	3.4	.39	.29	.92	4.8		2400
LRIS	CdC2	26	125	.37	150	9.0	1.40	.24	1.00	15.5	4030	
UHC					255	5.1	.84	.29	.88	9.9		2574
											24795	23605
										AVERAGE	3.7	3.5

1. Method of data analysis (UHC vs. LRIS)

   a. Requested from U. S. Army Corps of Engineers UHC field inventory data for slope, slope length, "C" and "P" data for 13 map symbols representing 856 UHC inventory cells (8560 acres or about 80% of the watershed area).

   b. Received raw data listings sorted by specific factors: "P", "C", soil type, land use, slope and slope length.

   c. From listings, calculated "C" and "P" factors for each soil type for cropland only.

   d. Corrected slope and slope length data by checking against original field data sheets.

   e. Removed from the listings slope and slope length data not pertinent to cropland for each mapping symbol.

   f. Eliminated selected cropland slope and slope length data where value seemed extreme for a given soil type.

   g. Prepared summary Table B1 comparing the two data bases and the erosion predictions resulting from each.

2. Analysis of summary Table B1.

   a. On the average for the entire watershed, there is little difference between erosion rates predicted using LRIS data and those predicted using edited and corrected UHC field data.

   b. UHC erosion rates are higher than LRIS for flatter soils.

   c. UHC erosion rates are lower than LRIS for steeper soils.

   d. UHC "C" factors are typically greater than LRIS for all soil types.

   e. "LS" factors are higher than LRIS for flatter soils.

   f. "LS" factors are lower than LRIS for steeper soils.

   g. UHC slope lengths are typically longer than LRIS for all soil types.

h. Slope percents are greater than LRIS for flatter soils.

i. Slope percents are lower than LRIS for steeper soils.

3. Summary observations

Because field data generally overestimated slope length when compared to LRIS slope length, slopes on flatter soils tended to be steeper, while slopes on steeper soils tended to be flatter. The resulting change in "LS", coupled with the typically greater "C" factors produced results which, for the watershed as a whole, were the same as those predicted by LRIS.

However, because of the typically greater UHC "C" factors, application of conservation tillage practices will have a greater impact on soil loss than would be expected using LRIS data base "C" factors. Therefore, programs designed to accelerate implementation of conservation tillage may potentially have a far greater impact on water quality than originally thought.

Computerized summaries of the inventory data and information produced a listing of BMP treatment needs by soil type. With input from SCS district conservationists, these treatment rate data were used in 1980 to estimate BMP needs for the entire 120,000 acre watershed. Final need estimates were combined with practice cost data from ASCS and SCS records to estimate costs for full-scale BMP implementation throughout the watershed. Inventory projection methodology and resulting need and cost estimates are detailed in the report, "Honey Creek Watershed Management Project--BMP Treatment Needs."

In addition to producing the treatment needs report plus field data to validate LRIS files and quantify streambank, roadside nonpoint sources, inventory efforts yielded several other benefits. Landowner contact was a key one. Initially it was not expected that the manager would need

contact each landowner while performing the inventory. However, as work began, it was apparent proper courtesy deem it necessary to contact landowners before walking their fields. As a result most landowners were told of the project and the manager was able to determine potential demonstration BMP cooperators based on contact response and field survey information.

B. Contact and assistance

Since it took all of 1979 to complete Upper Honey Creek inventory work, other methods were needed early in the project to determine landowners who might wish to help demonstrate a BMP. Here the county task forces were quite helpful. From names provided by them, project manager made follow-up contacts, by phone first and then by farm visit. Potential cooperators were also determined from "sign-ups" for ACP cost share assistance on BMP's.

It was at this time that the manager realized he lacked technical skills necessary to effectively assist farmers with planning of reduced and no-tillage BMP's. Further, because of other priority programs, task force members felt they could not provide much on the ground contact assistance help. They also felt that to successfully implement the conservation tillage BMP's, a person having field experience with conservation tillage methods would need be hired. Such a recommendation was made to the Joint Board. After much discussion at both regular and special board meetings, the Board requested a contract modification to hire a full-time project conservationist and to extend during 1979 the implementation of tillage demonstrations to Huron and Seneca counties. The Army Corps approved the modification and provided the Board an added $25,000 to perform the work. Conservationist hired was stationed during 1979 in the Bucyrus SWCD office, Crawford County, and later at the Seneca

Agricultural Center, Tiffin, Ohio.

As the Project progressed and with added Project staff help, it was less difficult to find farmers willing to participate with demonstrations. Contacts during 1980 and 1981 came from a variety of sources in addition to task forces: first year cooperators who were satisfied with BMP results, farmers attending workshops or tours of conservation tillage plots and farmers simply calling or coming into the Project office in Tiffin.

Based on these contacts, Project staff assisted farmers with initial planning of BMP's, especially tillage practices. Specifically, they helped farmers determine which BMP's might best be demonstrated on their farm. Through the Joint Board Project 4 farmers were assisted the first year with engineering practices while about 20-30 were assisted each of the 3 years with conservation tillage practices. Through the special ACP project, about 15-20 farmers per year were assisted with engineering practices, 20-30 per year with tillage BMP's.

Others assisted by Project staff and USDA task force members included custom spray applicators and engineering contractors, persons instrumental in proper application or construction of BMP's. Within the Project area about 6 applicators were individually contacted the first year about Project purpose and their role in spraying tillage plots. During the second and third year, 15-20 other applicators within the 3 county area were also informed about the project and invited to attend workshops describing proper application of fertilizers and herbicides in reduced and no-tillage fields. SWCD technicians and SCS district conservationists worked each year with 8-10 earth moving contractors to insure waterway construction according to design specifications. In 1981 one workshop, sponsored by the Crawford SWCD, was held with contractors to explore ways to achieve better establishment of waterways.

C. Recommend Demonstrations

The procedure for determining those BMP's that would be recommended for implementation began by suggesting to the task forces general categories or types or practices that were known to help improve water quality. From these suggestions, the task force offered ideas on ways to best apply the practice. For example, they felt no-till should be tried in several crop residue soil type situations continuously for 3 years, that good crop rotations be considered an integral part of reduced tillage practices, that certain types of planters or tillage tools would work best given conditions of residue type, drainage and equipment availability, that conventional plow tests be done alongside conservation tillage plots, and that extra care should be taken to gain early and quick grassed waterway establishment.

Task force members also recommended to the Joint Board payment rates that might be made to cooperators. Because of a late start the first year, Crawford task force representatives suggested that landowners be paid as high as $125 per acre for 10-15 acre plots for no-till, lesser amounts for reduced tillage. The second year it was suggested that payment for no-till be reduced resulting in a decision to set $80 per acre for 10 acre plots as a maximum payment amount. At task force meetings, too, members worked closely to coordinate Joint Board program and policy with the special ACP project. Where possible the task force encouraged uniformity of effort so as to emphasize the same BMP's and minimize confusion and misunderstanding among landowners participating in one or both of the projects offering incentive payments. For example, partially at the suggestions of the Crawford task force, and National and State ASCS Development Groups took action to permit ACP cost share for 3 consecutive years with farmers working to perfect no-till on their farms. This change made Joint Board and ACP

policy for no-till similar, thus aiding landowner acceptance of both efforts.

Task forces were also instrumental in recommending guidelines to insure proper exposure of demonstrations to the public. Specifically, practices should be near roads, be identified by signs, and be accessible for viewing during tours or by individuals--even those coming at night with flashlights!

Following input from the task forces, the Joint Board reviewed all suggestions and approved a program of demonstration practices. The first year this program was subject to Army Corps approval. After program approval Project staff were able to complete practice planning with farmers. This was done by filling in Joint Board, landowner agreement sheets specifying how practices were to be done. Agreements sheets were not used after the first year for engineering practices since cost share payments for all second and third year demonstrations were administered by county ASCS committees through the special ACP project.

Agreement sheets, especially those for conservation tillage, were then carefully reviewed by the county extention agent with assistance from extension agronomists. District conservationists reviewed proposed engineering demonstrations. Other task force members considered general workability of the practices planned. When it was agreed that all recommendations were technically correct, agreement sheets for the demonstrations to be done with payment assistance from the U. S. Army Corps contract funds were sent to the Joint Board for final approval. Once approved, these sheets represented the specific BMP's to be implemented as demonstrations. BMP's approved by this method included no-till corn and soybeans after a variety of previous crop residue and on representative watershed soil types, reduced tillage corn and soybeans, again under various conditions, and using

tillage tools commonly available (chisel plows, disks, field cultivators, coulter-chisels), a grassed waterway, an erosion cont[illegible] structure and critical area seeding of roadbanks.

D. Implement Demonstrations

With cooperators previously identified and with the BMP program developed and approved, preparations for BMP implementation began. Armed with the CES Agronomy Guide, the project conservationist worked with farmers to complete tillage plot agreement sheets.

Plot planning with these sheets addressed all those management considerations necessary to yield a best management practice! Factors considered were: (1) field selection--drainage, soil type, fertility, past insect or weed pressure, type and amount of previous crop residue; (2) use of cover crops; (3) fertility program; (4) herbicide program; (5) integrated pest management program; (6) proper use of tillage tools; (7) no-till planter use and calibration; (8) seed varieties and seed drop; (9) use and calibration of spray equipment.

Before planting, copies of the agreements sheets were provided to each custom applicator that would be spraying a demonstration plot. By this means applicators became aware of plot locations and exactly which herbicides to apply at what rates. Before planting, too, an attempt was made by the project conservationist to pre-calibrate all planters so they were generally ready to go the day of planting. The satisfactory completion of necessary reduced tillage operations or cover crop seedings was also checked.

During planting Project staff were present to assist each cooperator with routine planting chores and to insure proper planter operations--seed drop, seed depth and seed-soil contact. Staff recorded this data plus data on planting date, row fertilizers--formulation and rate applied, insecti-

cides--type and rate applied and general planting conditions.

After spraying and crop emergence, plots were routinely checked to document progress and to monitor any insect or disease problems. The CES pest management scout assisted project staff in this work. Whenever possible landowners or custom applicators were invited to help in this work in order to increase their knowledge of reduced tillage and no-till methods. Besides insect and disease information, data on emergence, weed control, distribution and amount of residue, field slopes and slope lengths and final stand were recorded.

At final maturity all plots were harvested and yields checked. This information plus all previous plot records were then summarized in a publication describing plot economics and estimates of erosion reduction--in essence, a booklet full of example conservation tillage BMP's.

Engineering BMP's were generally accomplished in a more "routine" fashion compared to the extra effort given the conservation tillage practices. While a few demonstrations were done with the addition of a Joint Board-landowner agreement sheet, most were done through ASCS cost share, SCS-SWCD technical assistance channels. In either instance, practices were done through a sequence of planning, field survey, design construction and construction checking. SWCD personnel supported by SCS district conservationists and project staff normally planned practices assuming construction by local contractors. One time, however, the Crawford County Engineer performed stabilization work along a township road.

The following table shows total annual practice accomplishment where ACP funds were used as monetary incentives. For a more detailed analysis of conservation tillage accomplishment to include consideration of economics for the farmer and the economics of BMP program implementation,

reference main text, Section VI, page 19.

	1979	1980	1981	
Grassed waterways	1.2	5.0	5.8	miles
Erosion structures	6	30	34	each
Cover crops	1200	1600	1500	acres
Critical area seeding	0.5	11.0	11.0	acres
No-till	253	460	1000	acres
Reduced tillage	74	65	-	acres

Sod berms and streambank stabilization using rip-rap were BMP's not strongly emphasized as a part of demonstration work in the Honey Creek watershed. Farmers along watercourses, especially ditches, were not eager to convert farm land into grass strips and the need for erosion control was usually at a point on the ditch rather than along the entire length. Also, because of high cost-benefit ratios and the lack of ACP cost share for bank stabilization work using rip-rap, application of this practice was minor.

E. Information - education

During the program start-up, information-education work was directed to landowners and farmers within the watershed, primarily Upper Honey Creek. Because of past attempts to organize a PL-566 project for drainage improvement within the watershed and because of adverse public reaction to an earlier Army Corps sponsored proposal to dispose of Cleveland municipal wastes near the watershed, genuine effort was made by the Joint Board, Project staff and supporting agencies to keep all communication about the Project clear, open and truthful. Special emphasis was given to Project purpose, positive aspects of the Project and how local people could respond to the challenge to improve water quality without excessive involvement of big government. Methods used to tell landowners about the Project included door to door contacts resulting from the inventory, meetings within the watershed at farm homes or township halls, newspaper articles, radio

shows and direct mailings of Project descriptive material. Subsequent work within the watershed indicated that a brochure, outlining Project purpose, scope and major work elements and mailed to each landowner during Project inception, was quite effective in helping people understand why there was a Project and how it was to work.

Following initial activities, a more comprehensive program was begun to inform farmers and others, within and outside the watershed area, about Project significance to farmers and the importance of implementing successful BMP demonstrations. Examples of approaches or activities employed in this comprehensive effort, in addition to those used during start up, include:

1. Project signs. Small 3x4 foot plywood signs made by a local Future Farmers of America group were placed along roadsides at each BMP demonstration. The signs displayed project name, type of BMP demonstrated and name of participating cooperator. Larger multi-colored 4x8 foot signs describing Project purpose and listing key participants (Army Corps, SWCD's, USDA agencies and farmers), were designed by CES for placement at points where major highways enter the watershed.

2. Workshops. County task forces with technical assistance from CES and Ohio State University (OSU) research scientists planned numerous workshops to help farmers and custom applicators better understand proper implementation of conservation tillage BMP's. Representatives from farm equipment dealerships, chemical companies and other agricultural businesses were invited to attend these workshops, too. In many cases agribusiness representatives familiar with conservation tillage methods (Chevron, Monsanto, others) presented a portion of the workshop program.

3. Tours of demonstration BMP's. Each year following planting of conservation tillage plots, tours of representative plots were held in both

Crawford and Seneca counties. Tours were given in early summer to show stand, weed control and protective crop residue, and in late summer to show condition of final stand and yield potential. While these tours were primarily for the benefit of local farmers and agri-business, other tours of tillage and engineering demonstration, plus the watershed area in general, were frequently given for interested farmers, agri-businessmen and governmental agency officials from outside the area. Examples of those attending these "other" tours were: farmers from other Ohio counties, other states and from Canada, state and federal USDA officials, state and federal USEPA officials, Army Corps officials, college professors, newspaper and magazine reporters, county commissioners, and officials of the Ontario, Canada, Ministry of Food and Agriculture. Each tour was planned to maximize participation of Honey Creek farmers. By this means, all persons attending tours could sense first hand Project and practice acceptance at ground zero.

4. Oral presentations. Talks were given by Project staff to numerous groups requesting information about the Project. Many presentations were given, for example, to professional organizations such as the Army Corps Interagency Technical Advisory Group, the Ohio Federation of SWCD's, the American Society of Agricultural Engineers and civic clubs such as Rotary, Lions and Kiwanis. Talks about Project work were also directed to young farmer groups and vo-ag students. In many cases, too, USDA task force members described Project progress or activities at various state and local meetings of their respective agencies.

5. Publications. Several printed publications were prepared to emphasize or document key aspects of the project. The most significant of these were the Honey Creek Watershed Project brochure, Tillage Demonstration Results booklets for 1979, 1980 and 1981 and "Using Conservation Tillage in

Northern Ohio" by Walter Schmidt and Don Eckert, CES agronomists.

6. Photo-slide documentation. All important project work was documented with 35 mm color slides. These visual aids enabled Project staff and others to more easily describe or explain Project purpose, organization, progress and accomplishments. Slides illustrating key BMP concepts (no-till planting, good crop stands with proper weed control, well established grassed waterways, etc.) were enlarged to 18x24" and displayed in SWCD and USDA agency offices, reminders that BMP's can be successfully applied.

7. Agency newsletters. To avoid creating the impression that the Project was an entity in itself and to effectively use existing lines of communication with farmers, USDA agency or SWCD newsletters were frequently employed to disseminate Project information.

8. Public media. Newspapers, radio, farm magazines and television were commonly used to inform the general citizenry about important Project events or results (Project beginning, tour information, technical aspects of conservation tillage systems, tillage plot yield results, etc.). County agents were helpful in efficiently utilizing these means of communications.

9. Other methods. Other avenues used to inform local people about the Project were displays at county fairs and guest speakers from outside the immediate area. A guest speaker, for example, might share with local farmers his experiences with no-till, thus instilling within them confidence to try this practice. To inform a national audience about the Honey Creek approach to implementing BMP's, a portion of the National Association of Conservation Districts' movie, "Your Land, My Land, OUR WATER", was filmed within the watershed.

Within this area of information-education, project accomplishments include the following:

Oral presentations, general	10/year
Oral presentations, technical	10/year

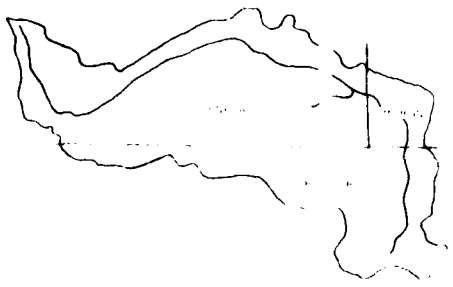
Workshops	2/year
Tours	8/year
Signs, highway	2/year
Signs, demonstrations	30/year
News releases	12/year
Radio, television	6/year
Agency newsletters	8/year
One - to - one contacts	Numerous

APPENDIX C

Results of Project Summary Meeting

Throughout the 3 year Honey Creek Project, Corps of Engineers, USDA and Soil and Water Conservation District awareness of Project status and results was good. Opportunities to discuss the Project during the course of routine activities to coordinate agency programs were ample. At the same time farmers were constantly challenged to help seek ways to make a program for implementation of BMP's work. Farmers were also promised that their thoughts on future BMP implementation programs would be included in any evaluation report sent to the Corps of Engineers. As a result and with input from the Interagency Advisory Group plus county task forces, a meeting was scheduled for January 27, 1982, in Willard, Ohio, to permit Project review and comment by farmers who had participated in the Project. See Exhibit C-1.

Before lunch the day of the meeting, staff reviewed Project objectives and results. Following lunch, farmers were divided into 6 discussion groups (5-7 persons per group) and asked to answer a list of questions relating to key project objectives or results. Answers were recorded in note pads color-keyed to question lists. Questions were prepared by Project staff in cooperation with county task force representatives. While some questions were the same on each list, others were different. See Exhibits C-2 through C-7. Following each question list are the transcribed notes from the respective note pads.



Honey Creek Watershed Management Project

COOPERATING AGENCIES

Soil Conservation Service — Soil & Water Conservation District

Cooperative Extension Service

Agriculture Stabilization and Conservation Service

155 E. Perry St.
Tiffin, Ohio 44883
January 11, 1981

Dear Friend,

Because of your past participation in the Honey Creek Project and because Project results may well influence future programs affecting farmers, you are invited to attend a Project summary meeting to be held:

January 27, 1982
10:00 am to 3:00 pm, Wednesday
Hi-Ho Restaurant, U.S. 224
Willard, Ohio

If you have a neighbor with Project interest, bring him or her along, too.

Purpose of the meeting is to review objectives and results of the Project. Then, following review, permit farmers and others closely involved with the Project locally to express their views on topics of importance to the Corps of Engineers, that agency responsible for developing a plan to improve Lake Erie water quality. Farmers will be influenced by portions of the overall plan, so this will be a chance to share your views on questions like:

1. What factor is most important in motivating farmers to try no-till? Was the factor included as part of the Honey Creek Project?

2. Have methods used in the Honey Creek Project been successful in encouraging farmers to try conservation tillage? Which things have been most successful? Which least?

3. What economic incentives (or penalties) other than cost share might be initiated to help encourage greater use of conservation tillage by farmers?

We certainly hope you can come to help conclude the Project with constructive suggestions for future work. Your thoughts will be included as part of the final report to the Corps of Engineers.

To plan for meals, please notify us of your attendance by January 22 using the enclosed stamped and pre-addressed card. Thank you.

Sincerely yours,

Lee E Buckingham

Lee Buckingham, Chairman
Honey Creek Joint Board of Supervisors

lb/JC/lk

Exhibit 1

QUESTION LIST A (WHITE)

1. Future national programs to accelerate farmer adoption of conservation tillage may well be based on the approach used in the Honey Creek Project. Is the Honey Creek approach correct? How should it be improved assuming farmers will ultimately need do their part in reducing erosion and improving water quality?

2. The Honey Creek approach was voluntary from the standpoint of farmer participation. Should the voluntary approach in certain instances fail, how should erosion control be done on land where soil loss is severe and owners choose not to participate?

3. What factor is most important in motivating farmers to try no-till? Was the factor included as part of the Honey Creek Project?

4. Based on your experiences with no-till, what advice would you have for a neighbor wanting to try no-till corn? No-till soybeans?

5. What answers are needed from research in order to increase success rates with no-till crop production?

6. Do you have comments or strong feelings about programs designed to accelerate adoption of conservation tillage by farmers?

Responses to Question List A (White)

Group participants: Jerry Niese, Gene Studer, Lonnie Holt, Tom Niese, Sam Spitler, Lee Buckingham, Bob Smith (SCS).

1. Liked the Honey Creek approach from the standpoint that there was a one on one person available to assist in the field with getting the program on the land. More of this type of assistance might have been provided.

Landowners seemed to like the voluntary type approach to implementing the program.

The bad plots must be shown along with the good plots. Showing the poor situation may be one of the most important ways of demonstrating what not to do. Showing problems may help others to avoid making the same mistakes.

The Honey Creek Project was liked because it showed what works in a local area and not 80 miles away.

2. Education - communication.

By education - enhance pride in the land owners somehow!

3a. Show that practices can be profitable. Show that practices are possible and that they will work.

3b. Education - prior to full-scale demonstration put out small display plots on selected fields to show farmers that conservation tillage will work. Through such displays, farmers will develop good feelings about no-till by seeing that when things are done correctly no-till can work on his farm. This was not done in the Honey Creek Project.

3c. Having someone available to work on a one on one basis. Yes, this was done.

4. For either no-till corn or no-till soybeans, start small and grow

with no-till. Don't jump in and go hog wild. Be willing to make the needed adjustments.

Newcomers better start out in cover-clear fields.

5. Local research for that area. Maybe demonstration work in each county would be more effective.

6. No answer.

QUESTION LIST B (BLUE)

1. Future national programs to accelerate farmer adoption of conservation tillage may well be based on the approach used in the Honey Creek Project. Is the Honey Creek approach correct? How should it be improved assuming farmers will ultimately need do their part in reducing erosion and improving water quality?

2. The Honey Creek approach was voluntary from the standpoint of farmer participation. Should the voluntary approach in certain instances fail, how should erosion control be done on land where soil loss is severe and owners choose not to participate?

3. What factor is most important in motivating farmers to try no-till? Was the factor included as part of the Honey Creek Project?

4. Based on your experience with cover crops in no-till crop production, when would you recommend their use? When would you suggest cover crops not be used?

5. What information-education activities were most important in expanding knowledge about conservation tillage in the Project area?

6. Do you have comments or strong feelings about programs designed to accelerate adoption of conservation tillage by farmers?

Responses to Question List B (Blue)

Group participants: Mike Hall, Robert Gray, Rich Reichert, Howard Von Stein, Bill Smith (SWCD), Bill Kleman (CES)

1. Yes. Drainage needs to be stressed, especially internal drainage on Blount soils. It is felt that a portion of an untiled area of 10 to 15 acres should be tiled every 50' to see no-till crop response differences in well-drained area compared to poorly drained. More research on use of urea-nitrogen fertilizer need. More planting should be done when soil is ready, not according to calendar dates.

Project should be longer to have greater value.

2. Continue on a voluntary basis with an improved and wider education program developed.

Education programs should stress the dollar value of soil lost.

3a. Cost-sharing, especially first year.

3b. Technical help.

3c. More education and resources. Yes, all were a part of the Project.

4. Cover crops should be used. However, cover crops other than rye might be used. Too often rye can grow out of control. Field brome grass might be considered as cover crop. Use cover crops on steep sloping soils; they should not be used on flat wet soil. When good cover of corn stover is present, no cover crop should be used.

5. Tours, harvest data (Tillage Results Books), demonstrations, technicians (CES agronomist, tillage technician, etc.), explaining chemical and fertilizer results (technical aspects) at tours.

6. Local Soil and Water Conservation Districts need support (technical assistance, dollars, etc.) to accomplish what is needed. Feel education is an important part of any future programs.

QUESTION LIST C (GREEN)

1. Future national programs to accelerate farmer adoption of conservation tillage may well be based on the approach used in the Honey Creek Project. Is the Honey Creek approach correct? How should it be improved assuming farmers will ultimately need do their part in reducing erosion and improving water quality?

2. The Honey Creek approach was voluntary from the standpoint of farmer participation. Should the voluntary approach in certain instances fail, how should erosion control be done on land where soil loss is severe and owners choose not to participate?

3. What factor is most important in motivating farmers to try no-till? Was the factor included in part of the Honey Creek Project?

4. Based on your experience with no-till corn, what type of nitrogen program would you recommend to a neighbor?

5. Payment incentives and cost share were components of the Honey Creek approach. Should such incentives be included in future conservation tillage programs? On what practices and for how many years should farmers be eligible for conservation tillage incentive payments?

6. Do you have comments or strong feelings about programs designed to accelerate adoption of conservation tillage by farmers?

Responses to Question List C (Green)

Group participants: Steve Sawyer, Burton Geissman, Ross Eckstein, Don Crum, Carl Clouse, Floyd Reinhart (ASCS), Sandy Pensyl (ASCS Trainee)

1. We agree that the voluntary approach used in Honey Creek was better than a required program.

We would recommend that more dollars and more technical help should have been available to reach more people.

More machinery should have been available because of limited planting time. This could be done through leasing from dealers.

2. Incentives such as cost share could be used if a volunteer approach fails.

Legal action as a last resort.

Everything should be done to make it voluntary. Farmers are the best information source to other farmers. Farmers believe farmers.

Crop rotation is a very good erosion control practice.

3. Cost share is most important.

Loss of soil and value of lost soil in terms of dollars was also important.

Yes, these items were included in the Honey Creek Project.

As well, good leadership and good practical experience (worked with before) to provide help to the farmer were quite important.

All of the above items were included in the project.

4. 28% worked well.

Side dress with 82% (anhydrous) was another good option.

Urea is probably not the best program.

Knifing in nitrogen works better when cover crops are used.

5. Where conservation tillage practices are new to an area or new to the person, the incentive (cost share) is good.

It is good to limit the incentive amount in order to help more people.

We agree it should be used in future years.

At least 3 years cost share on no-till.

Waterways, etc., should also be cost shared on.

6. We feel it would be better to adopt programs before they became mandatory.

We feel that more equipment should be available. This would speed up the program adoption.

More advertising should be done on final yields.

Higher fuel cost would speed up no-till. However, we do not want higher fuel cost.

QUESTION: How do we repair washouts in a field of no-till? This is a problem. No-till doesn't solve all erosion problems.

QUESTION LIST D (PINK)

1. Future national programs to accelerate farmer adoption of conservation tillage may well be based on the approach used in the Honey Creek Project. Is the Honey Creek approach correct? How should it be improved assuming farmers will ultimately need do their part in reducing erosion and improving water quality?

2. The Honey Creek approach was voluntary from the standpoint of farmer participation. Should the voluntary approach in certain instances fail, how should erosion control be done on land where soil loss is severe and owners choose not to participate?

3. What factor is most important in motivating farmers to try no-till? Was the factor included as part of the Honey Creek Project?

4. At what rate will farmers within the Project area expand the use of conservation tillage in the future? What will be the major factor determining expanded use?

5. Should practices other than conservation tillage (e.g., grassed waterways, erosion control structures, etc.) be included in future programs to improve water quality? Why? Why not?

6. What economic incentives (or penalties) other than cost share might be initiated to help encourage greater use of conservation tillage by farmers?

7. What important factors today discourage use of conservation tillage by farmers?

8. Do you have comments or strong feelings about programs designed to accelerate adoption of conservation tillage by farmers?

Responses to Question List D (Pink)

Group participants: Marion Kelbley, Harold Welter, Art Hall, Joe Niese, Mark Fritz, Bill Stuckey (CES).

1a. We believe the approach used was sound. The two key ingredients were the subsidy and the presence of a technical advisor on the scene. The subsidy reduced risk for the cooperator and the technical advisor provided the cooperator with a feeling that he was doing most things correctly.

1b. Increased educational efforts about the seriousness of soil erosion through farmer to farmer contact.

2. Farmers who do not hold soil losses to an acceptable level could be deprived of the benefit of present farm programs and loans. Perhaps ASCS could determine who is and who isn't holding soil losses to an acceptable level.

3. We feel that both the subsidy and the technical assistance are indispensable.

4a. 5-10% increase per year for a couple years; then progressively lower rates of increase thereafter.

4b. Local success of no-till acres.

5a. Yes.

5b. To control soil losses that conservation tillage cannot control. Also, grassed waterways are easier to farm across than gullies.

6. Tax advantages on purchase of conservation tillage equipment; e.g., investment credit of 20%. Also, those practicing conservation tillage could be entitled to higher loan and target rates.

7a. Luck or and cost of operating conservation tillage equipment.

7b. Lack of efective slug control measures.

7c. Fear of failure.

7d. In flat, heavy-soil regions no-till's tendency to retain soil

moisture creates a host of problems. Ridge planting may be the answer there.

8. These programs must have farmers included in the planning and administration.

QUESTION LIST E (YELLOW)

1. Future national programs to accelerate farmer adoption of conservation tillage may well be based on the approach used in the Honey Creek Project. Is the Honey Creek approach correct? How should it be improved assuming farmers will ultimately need do their part in reducing erosion and inproving water quality?

2. The Honey Creek approach was voluntary from the standpoint of farmer participation. Should the voluntary approach in certain instances fail, how should erosion control be done on land where soil loss is severe and owners choose not to participate?

3. What factor is most important in motivating farmers to try no-till? Was the factor included as part of the Honey Creek Project?

4. Based on your experience with no-till, how could planters or drills be improved to do a better job?

5. How much conservation tillage would have been done in the Honey Creek area today without benefit of the Honey Creek Project?

6. Do you have comments or strong feelings about programs designed to accelerate adoption of conservation tillage by farmers?

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HONEY CREEK WATERSHED PROJECT, FINAL PROGRAM EVALUATION REPORT,--ETC(U)
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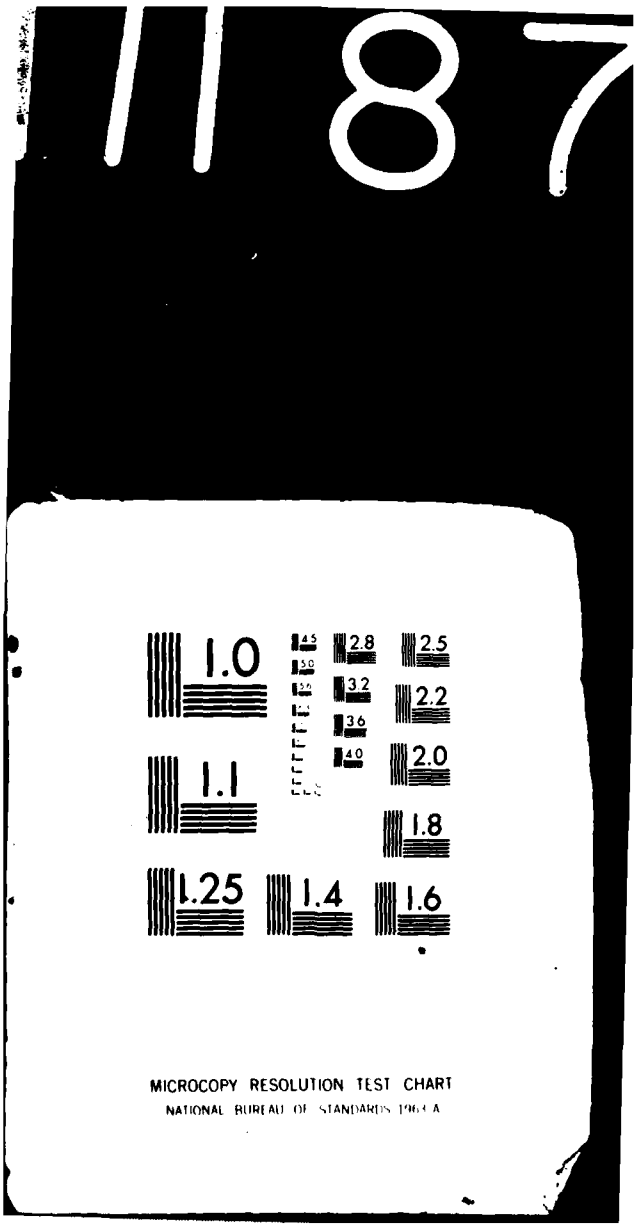
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NATIONAL BUREAU OF STANDARDS 1964 A

Responses to Question List E (Yellow)

Group participants: Bob Featheringill, Milt Leonhard, Roger Marquart, Patrick Nolan, Jason Kalb, Jerry Beck (ASCS)

1. The approach is correct since there was a cushion (incentive payment) provided to help in case a financial loss was experienced through a crop loss. The concensus was that no-till would be tried again even after a financial loss compared to conventional tillage. The education portion of the program was a benefit to farmers and the project. It was felt the possible no-till corn crop dollar loss was more than the value of soil retained in the field. The education should be provided before actual projects begin.

2. Education on a one to one basis comparing conservation benefits to losses or costs where conservation is not practiced. A farmer should be rewarded for doing a good conservation job as a penalty does not often have a positive reaction regardless of subject. Rewards in form of reduction in cost of ditch maintenance and eligibility for loan programs are examples.

3. The actual sight of seeing little or no erosion after heavy storm periods on no-till compared to adjacent conventionally tilled areas, also realizing the dollar value of tonnage loss of soil per disturbed area. Yes, this factor was included except for the tonnage loss value.

4. Depth adjustment in planters--making it easier to change--improved seed-soil contact through better press wheels. Management is still, however, the key to obtaining the proper results and crop stand. There are more improvements necessary for drills than planters. There needs to be greater availability of unit planters which can plant both 30" corn and 15" beans. Two separate units increase costs.

5. There would have been chisel plow-miller disk tillage method done as today but very little if any no-till done.

6. On farm education is the best benefit received through such a

project whether it addresses nutrients, herbicides, equipment purchase/operation, etc.

QUESTION LIST F (GREEN)

1. Future national programs to accelerate farmer adoption of conservation tillage may well be based on the approach used in the Honey Creek Project. Is the Honey Creek approach correct? How should it be improved assuming farmers will ultimately need do their part in reducing erosion and improving water quality?

2. The Honey Creek approach was voluntary from the standpoint of farmer participation. Should the voluntary approach in certain instances fail, how should erosion control be done on land where soil loss is severe and owners choose not to participate?

3. What factor is most important in motivating farmers to try no-till? Was the factor included as part of the Honey Creek Project?

4. Have methods used in the Honey Creek Project been successful in encouraging farmers to try conservation tillage? Which things have been most successful? Which least?

5. Assuming future programs to clean up Lake Erie would require national level coordination, would the Corps of Engineers be a suitable agency for doing the job? Would another agency be more suitable?

6. Do you have comments or strong feelings about programs designed to accelerate adoption of conservation tillage by farmers?

Responses to Question List F (Green)

Group participants: Delbert Morter, Nick Laibe, Tony Schock, Don Phenicie, Albert Heydinger, Art Heydinger, Gene Baltes (SCS).

1. Approach was well accepted and successful. Method was the best group could think of. Farmers outlook or attitude improved each year of project.

2. Cross-compliance with other USDA programs should be considered. The group did not feel mandatory controls would work. There should be tax incentives for performing conservation practices.

3. The group thought that good technical assistance was the most important factor in motivating farmers to try no-till. Yes. The high quality and self-confidence of Honey Creek personnel made the project successful.

4. Yes. Having demonstration plots near roads for the public to see. Holding tours, publishing results in papers and magazines. News releases of location of plots. Plot signs.

No unsuccessful methods were noted by this group.

5. On the Honey Creek project, the Corps of Engineers worked very well with the local Joint Board and staff. Whichever agency that can get the most funds to do the job should coordinate the program.

6. Local task forces with farmers as members should be a part of any program set-up.

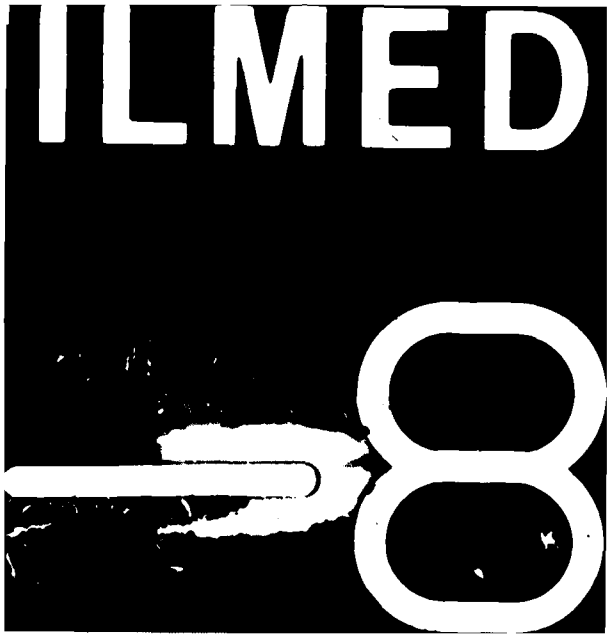
Closing Comments by Participants

Gene Studer: Perhaps consumers need education about what to eat. Change in eating habits might produce changes in crop rotations that would decrease erosion. As well, changes in market prices might encourage the planting of crops other than corn and soybeans, crops that don't cause as much erosion.

Jerry Niese: Farmers like to see things work. No-till equipment demonstrations would be very useful in helping others see how no-till can work. Invite FFA students to demonstrations. Let equipment dealers demonstrate their equipment.

Floyd Reinhart: TV has a great impact on the education of children. Perhaps programs or TV games could be developed to increase child awareness of soil erosion problems.

Carl Clouse: Asked group if they knew that, had ASCS been funded through the years as it was in the 30's, the current ASCS budget for ACP would be 32 billion. A much better erosion control job could have been done if backed by such dollars. Also asked group if they knew ASCS committeemen were elected by agricultural landowners in the county, not by all county residents as are members of the local SWCD boards. This difference in the future could cause significant urban influence on farm programs managed by SWCD's. Those planning programs should be aware of this fact. They should also not write ASCS out of the cost-share business. ASCS has done the job well and can continue to do so if properly funded.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